THE IRON TRADE REVIEW

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OLD YEAR WAS RECORD BREAKER FOR MANY

In Spite of the Creeping Paralysis of Trade---Disagreement Concerning Price Question---All Markets Slow

The year 1909 will long be remembered on account of the wonderful recovery from profound depression to great prosperity which took place without the violent fluctuations in prices which characterized other periods. The year now closing will be recalled on account of the wholly unexpected and steady decline which followed a few weeks of great activity and splendid promise. It has been a year of creeping paralysis of trade. The decrease in business was not, however, so sudden as to prevent many companies from making a good showing on the total business of the year. In fact, a surprisingly large number of manufacturers report that 1910 has been a record year with them. In the absence of all business of importance in the way of new orders, much attention is being given to the question of prices, and in some centers there seems to be a growing sentiment that definite action should be taken at an early date upon prices of ore and finished steel. On the other hand, the opinion is held by many that it would do absolutely no good, and might even cause further depression, to reduce prices at the present time. As to what will be done, nobody knows. As to present prices it is granted that there is considerable regularity, but inquiry has not been such as to test quotations. Toward the close of last year, there was a grand rush to specify before the expiration of contracts. This year, consumers are specifying very slowly, as they do not fear being unable to buy after the year at as low prices as those provided in existing contracts. Estimates as to stocks of finished materials in users' hands are not convincing. Export business continues good, probably due to the fact that some other countries—notably Great Britain—are now enjoying prosperity.

Reduced Output

Iron and steel production in the country will be considerably cut down the current week, owing to the holiday suspensions of the mills and furnaces. A number of plants resumed Tuesday, but general renewal of activity has been slow. Some of the furnaces of the United States Steel Corporation will remain banked the remainder of the present week. Operations of the Tennessee Coal, Iron & Railroad Co. are practically at a minimum this week. The few active finishing mills of the Bessemer plant at Bessemer, Ala., are using billets from stock.

Pig Iron

With the exception of a fair amount of buying by cast iron pipe interests in the eastern territory, the pig iron market is extremely dull. Reports of sales of malleable at very low prices in the Philadelphia district are current. The quotation of $11, Birmingham, for No. 2 foundry for delivery up to July 1 is more general, but some interests will not make it. An effort of manufacturers of basic in the Mahoning and Shenango valleys to form a selling association has apparently failed. This effort may be revived at a later date, but it is doubtful whether the promoters will exhibit the patience of those who have long been endeavoring to organize a selling agency for Connellsville coke.

Railroad Buying

The rail orders of the New York Central and Pennsylvania railroads have not been entered on account of failure to agree with the mills upon specifications. There is very little rail business being placed, and as long as the net earnings continue to show sharp decreases and the rate question remains unsettled, it is not probable that there will be much activity in the rail mills. In the Pittsburg district, there is renewed hope that some of the pending inquiries for cars will soon be placed.

Structural Material

The month has been a light one for structural contracts, the total being about 60,000 tons, of which about 25,000 went to the American Bridge Co. The material for the Bon Marche store, Seattle, 1,450 tons, will be fabricated by the Vulcan Iron Works, of that city. Some of the steel may be imported. Stone & Webster, Boston, are in the market for 1,500 tons of steel for a pipe line near Seattle. In the city of Vancouver, B. C., buildings to be erected in the spring will require about 30,000 tons. Bids have been submitted on 8,500 tons for a bridge across the Willamette river, at Portland, Ore.

WORLD'S IRON MARKETS

PITTSBURG

Year Closes With Market Very Quiet —Negotiating for Coke.

Office of THE IRON TRADE REVIEW,
510 Park Building, Dec. 27.

The closing week of the year has been an extremely quiet one in the Pittsburg territory, but there is no evidence of weakness in the iron and steel market. Manufacturers have succeeded in maintaining prices on all finished lines. Following a series of meetings held a few weeks ago, extremely low quotations entirely disappeared. In some instances, consumers are beginning to specify against contracts for finished products, particularly steel bars, sheets, tin plate, wire and nails, for first quarter delivery, but the total tonnage entered so far is comparatively light and buyers generally are not giving a great deal of attention to their requirements over the first three months of the new year. Three steel companies in this district report that specifications entered on mill books during the month of December show a slight gain over November.

One of the encouraging features of the local situation is that the railroads are giving considerable attention to pending car inquiries and the indications are that awards will be made within the next week by two or three initial roads for approximately 5,000 cars. Miscellaneous business in steel bars, plates and shapes shows little change from last week and no sales have been reported below 1.40c, Pittsburg. Prices of wire and wire nails are firmer and jobbing interests are negotiating for their first quarter requirements.

The market on forging billets has been definitely established at $28, makers' mill, Pittsburg, by scattered sales of small lots during the past week by three local companies. On Bessemer and open-hearth sheet bars prices are firm at $23 and $24, respectively, makers' mill, Pittsburg or Youngstown. Several contracts for sheet bars will expire Dec. 31, but there has been no important trading for delivery into the new year.

Aside from the extension of a contract made some time ago whereby a valley furnace will furnish 3,500 tons of Bessemer pig iron a month to the Valley Mold & Iron Co. over the first quarter, there has been practically no trading in the local pig iron market. Basic manufacturers are not as anxious to take business at low prices as a month ago and the market is quotable at $13.50, valley. Several large consuming interests are negotiating for their coke requirements over 1911, but no large transactions have been reported in this territory. Plans for the formation of the proposed central coke selling agency are being discussed this week by Connellsville coke producers.

Pig Iron.—No important inquiries have developed in this market during the closing week of the year, notwithstanding that a number of large consumers have not bought any iron for delivery beyond Dec. 31. In a few instances, consumers are quietly sounding the market, but the volume of business under active negotiation is very light. On the other hand, sellers are showing a disposition to maintain prices and several furnace interests are not anxious to take business at quotations established recently. Shipments this month have been comparatively light. Investigation shows that there is very little tonnage in consumers' hands.

The basic situation continues to attract a great deal of attention and prices are firmer than for several weeks. Offers of $13.40, valley, on small lots of basic for immediate shipment have been rejected by several furnaces and some sellers will not accept business below $13.75, valley. So far there has been little trading in basic for first quarter shipment and for this reason furnace interests anticipate more general inquiry within the next ten days. Odd lots of malleable for early shipment have been sold on a basis of $13.50, valley, and there is an inquiry pending for 2,000 tons of this grade.

Bids are being received by the Pennsylvania Railroad Co. on approximately 1,500 tons of foundry iron for delivery at Altoona, Pa., and this business probably will be placed before the end of the week. We quote the market as follows:

Pig Iron Prices.

(Prompt Shipment.)

Bessemer, valley	$15.00
Bessemer, Pittsburg	15.90
Basic, valley	13.50
Basic, Pittsburg	14.40
No. 2 foundry, Pittsburg	14.65
Gray forge, Pitsburg	13.90
Malleable, Pittsburg	14.40

(First Half.)

Bessemer, valley	$15.00
Bessemer, Pittsburg	15.90
Basic, valley	13.50
Basic, Pittsburg	14.40
No. 2 foundry, Pittsburg	14.90
Gray forge, Pittsburg	13.90
Malleable	14.40

Ferro-Alloys.—Consumers of ferro-alloys having covered for their first quarter requirements, the local market is showing little life. Odd lots of ferro-manganese have been sold at $38.50, Baltimore, although a few sales have been reported at $38.25, Baltimore. Low prices are being quoted on 50 per cent ferro-silicon for first half, although there has been little trading during the past week.

We quote ferro-manganese at $38.50, Baltimore, for prompt and first half of 1911. The freight rate from Baltimore to Pittsburg is $1.95 per ton.

Fifty per cent ferro-silicon is quoted at $55, Pittsburg, for prompt and first half; 12 per cent, $25; 11 per cent, $24; 10 per cent, $23, f. o. b. Jisco and Ashland furnaces. The freight rate to Pittsburg is $1.90. The foreign grades are held at $1 or more a ton over domestic prices.

Plates.—Developments in the local plate market during the past ten days have been somewhat encouraging. Inquiries are pending for from 2,100 to 2,500 freight cars for the Pittsburg, Shawmut & Northern railroad; 2,000 cars for the Wabash-Pittsburg Terminal Railroad Co.; 1,000 cars for the Kanawha-Michigan railroad, approximately 2,000 cars for the Buffalo, Rochester & Pittsburg railroad, and 500 for the New York, Ontario & Western railroad, and it is expected that awards for some of these cars will be made before the end of the week. Two or three steel companies report that specifications against running contracts in December will exceed those of October and November. There is not a great deal of new business appearing, although prices are

firm. It is expected that definite action will be taken shortly after the first of the year on some of the new projects outlined recently, which will involve fairly heavy tonnage of plates. We quote the market as follows:

Tank plates, ¼ inch thick, 6¼ to 100 inches, 1.40c. Extras are as follows, per 100 pounds: Boiler and flange steel plates, 0.10c; A. B. M. and ordinary firebox steel plates, 0.20c; still bottom steel, 0.20c; marine steel, 0.40c; locomotive firebox steel, 0.50c; all sketches excepting straight taper plates varying not more than 4 inches in width at ends, narrowest end not being less than 30 inches, 0.10c; circles, 0.20c. Plates in widths over 100 inches up to 110 inches, 0.05c; over 110 inches up to 115 inches, 0.10c; over 115 inches up to 120 inches, 0.15c; over 120 inches up to 125 inches, 0.25c; over 125 inches up to 130 inches, 0.50c; over 130 inches, 1c. Gages under ⅛ inch to and including 3-16 inch plate on thin edge, 0.10c; under 3-16 and including No. 9, 0.25c. Five cents extra for less than carloads. Terms net cash in 30 days.

Sheets.—In a few instances consumers are covering for their requirements over the first few months of 1911, but the market as a whole is quiet and consumers are not ready to contract very far ahead at today's prices. Specifications are running light, although prices appear to be firm. We quote prices as follows with $1 a ton added as the delivered price in the Pittsburg district:

Blue annealed sheets, No. 10 gage, 1.65c; box annealed sheets, No. 28 gage, 2.20c; galvanized sheets, No. 28 gage, 3.20c; painted roofing sheets, 1.55c per square for No. 28 gage, 2½-inch corrugation; galvanized roofing sheets, 2.75c per square for No. 28 gage, 2½-inch corrugation.

Tin Plate.—Some of the mills which are booked heavily for the first six months of 1911 are receiving specifications for shipment during January, February and March and the indications are that many of the mills which have been idle since Dec. 1 will be started again within the next 10 days. Some of the large consuming interests which have covered for their first half requirements are showing a disposition to cover for the last six months of 1911, although some mills are not accepting business for delivery beyond July 1. The base price on tin plate is as follows:

Coke tin plate, 10-pound basis, 14 x 20, $3.60, f. o. b. mill, Pittsburg district.

Rails and Track Material.—Recent developments in this market indicate that some of the trunk lines may take final action this week on their steel rail requirements over 1911. The dispute over the Pennsylvania Railroad Co.'s rail orders has not yet been adjusted, but steel companies do not expect any serious difficulty of this character in connection with rail orders of other roads. It is expected that within the next 10 days some fairly large awards will be made by traction interests and users of light rails for 1911 delivery. Demand for spikes and track bolts continues light, owing to the fact that transportation companies have not taken final action on their construction and improvement program for 1911. We quote the market as follows, the base price on open-hearth rails being 1.34c, per pound, at the mill:

Fifty-pound and heavier, 1.25c per pound; carloads and less than 500 tons, 1.34c per pound; light rails on base weight of 40 to 45 pounds, $26.50 to $27, the schedule on the other weights being irregular and subject to negotiations; angle splice bars for standard sections, 1.50c, Pittsburg; standard spikes, 1.55c to 1.60c, Pittsburg; hand spikes, 1.65c to 1.70c, Pittsburg; track bolts, 2.30c, Pittsburg.

Steel.—Conditions surrounding the semi-finished steel market show no material change from a week ago. Prices are firm, local mills refusing to accept orders for small lots of billets and sheet bars below $23 and $24, respectively. Several fairly large contracts for both billets and sheet bars will expire this week, but no arrangements have been made as yet to renew or extend these contracts. Three large companies in the Pittsburg territory report small sales of forging billets at $28, Pittsburg, and the market has been pretty well established at this figure. In a few instances, consumers of sheet bars are sounding the market with a view of covering for January, February and March, but actual bookings are being confined to urgent needs. We quote the market as follows:

Bessemer 4 x 4 billets with 0.25 carbon and less are quoted at $23, with the usual extras for size and analysis, and open-hearth rolling billets, $23. Forging billets are quotable at $28. Bessemer sheet and tin bars are quoted at $24, and open-hearth sheet bars are quoted at $24, makers' mill, Pittsburg or Youngstown, with full freight to destination added.

Hoops and Bands.—Specifications are light and there is very little business being booked for prompt or forward delivery. Prices are unchanged. We quote the market as follows:

Hoops in carload lots, 1.50c; in less than carload lots, 1.65c; bands, 1.40c, base, with net extras, as per standard steel.

Merchant Bars.—Actual bookings of steel bars for the month of December will show a slight decline as compared with the preceding month, orders from consumers, who have been buying in a hand to mouth fashion, having been cut down during the past 10 days. The outlook for this market during the ensuing year is bright and farm implement makers are looking forward to a busy season and are specifying rather freely against contracts for delivery over the first three months. Bar iron is quotable at 1.40c, Pittsburg, although a few mills are understood to have shaded this price slightly on particularly desirable business. Orders are light and the railroads are not specifying quite as freely as a month ago. Mills which were running three and four months behind on deliveries on shafting during the first half of the year have comparatively little tonnage on their books at present. We quote the market as follows:

Common iron bars, 1.35c to 1.40c, Pittsburg; Bessemer and open-hearth steel bars, 1.40c; plow and cultivator, 1.40c; channels, angles, zees, tees, under 3-inch, 1.50c, all f. o. b. mill. The following differentials are maintained on steel: Less than 2,000 pounds of a size, 0.35c advance. Cold rolled and ground shafting, 55 per cent in carloads and 50 per cent in less than carloads, delivered in base territory.

Muck Bar.—Consumers are covered for their early needs and few sales have been reported. We quote the best grades of muck bar at $29, Pittsburg.

Structural. — Indications point to greater activity in the structural steel market in this territory shortly after the first of the year, as the city of Pittsburg is making arrangements to go ahead with the erection of the proposed new city hall and the construction of a new bridge across the Allegheny river in the Point district, while other new building projects outlined some time ago are being revived. No large awards have been made during the past 10 days, although both steel companies and fabricators are more optimistic than for some time. An independent steel company will furnish 1,000 tons of steel to be used in the erection of a new building at Beaver Falls, Pa., for the Standard Sanitary Mfg. Co. A contract has been awarded to the Thompson-Starrett Co. for the addition to the Western Theological Seminary, Pittsburg, to cost $125,000, but a contract for the steel has not yet been awarded. Bids will be asked shortly for the proposed new office building to be erected at Youngstown, O., for the Republic Iron & Steel Co. We quote the market as follows:

Beams and channels, 15 inches and under, 1.40c; over 15 inches, 1.50c; zees, 1.40c; tees, 1.45c; angles, from 3 to 6 inches, 1.40c; over 6 inches, 1.50c; universal and sheared plates, 6¼ inches wide and wider, 1.40c.

Merchant Pipe.—In some instances, jobbing interests are negotiating for their requirements over the first three months of 1911, although the market as a whole continues very quiet. No particularly large awards for line pipe have been placed during the past week, and comparatively small tonnage is involved in inquiries now pending. Some of the pipe mills which have been idle practically all this month will resume operations the first week in January. There is less talk of price concessions, and, while slight shading is reported in some sections, the discounts quoted below are being maintained. We quote

the following official discounts in carload lots, subject to the usual preferential discount to the larger buyers, merchant pipe, where specified, being offered in from ⅛ to 6 inches:

Iron and Steel Basing Prices.

	Steel.		Iron.	
	Butt weld.			
	Black.	Galv.	Black.	Galv.
⅜, ¼, ⅜ inch	72	58	68	54
½ inch	75	63	71	59
¾ to 1¼ inch.....	79	69	75	65
2 to 3 inches.....	80	70	76	66
	Lap weld.			
2 inches	76	66	72	62
2½ to 4 inches.....	78	68	74	64
4½ to 6 inches.....	77	67	73	63
7 to 12 inches	75	59	71	55
EXTRA STRONG, PLAIN ENDS.				
	Butt weld.			
⅜, ¼, ⅜ inch.....	69	59	65	55
½ inch	74	68	70	64
¾ to 1¼ inch	78	72	74	68
2 to 3 inches.....	79	73	75	69
EXTRA STRONG, PLAIN ENDS.				
	Lap weld.			
2 inches	75	69	71	65
2½ to 4 inches.....	77	71	73	67
4½ to 6 inches.....	76	70	72	66
7 to 8 inches.....	69	59	65	55
9 to 12 inches.....	64	54	60	50
DOUBLE EXTRA STRONG, PLAIN ENDS.				
	Butt weld.			
½ inch	64	58	60	54
¾ to 1¼ inch	67	61	63	57
2 to 3 inches.....	69	63	65	59
DOUBLE EXTRA STRONG, PLAIN ENDS.				
	Lap weld.			
2 inches	65	59	61	55
2½ to 4 inches.....	67	61	63	57
4½ to 6 inches.....	66	60	62	56
7 to 8 inches.....	59	49	55	45

Plugged and reamed pipe is furnished at 2 points higher price, either butt or lap weld.

Boiler Tubes.—This market is showing little life on account of the light buying of locomotives and the falling off in demand for merchant boiler tubes. We quote the market as follows:

	Steel.	Iron.
1 to 1½ inch	49	43
1¾ to 2¼ inch	61	43
2½ inch	63	48
2¾ to 5 inch	69	55
6 to 13 inch	60	43

2½ inch and smaller, over 18 feet, 10 per cent net extra.

2¾ inch and larger, over 22 feet, 10 per cent net extra.

To destination east of the Mississippi river will be sold at delivered discount for carloads lowered by two points, for lengths 22 feet and under; longer lengths, f. o. b. Pittsburg.

Wire Products.—Some of the large jobbing interests are negotiating for their first quarter and first half requirements and manufacturers of wire products expect some fairly large awards within the next 30 days, as stocks are very low. Prices are firm and plain wire and wire nails have not sold below $1.50 and $1.70, respectively, during the past week. Demand for cut nails is not very heavy, and the market is quotable at $1.65 to $1.70, Pittsburg. We quote the market as follows:

Wire nails, jobbers' carload lots, $1.70; retailers' carload lots, $1.75; cut nails, jobbers' carload lots, $1.65 to $1.70; painted barb wire, jobbers' carload lots, $1.70; retailers' carload lots, $1.75, with 30c for galvanizing; plain wire to jobbers in carloads, $1.50, and to dealers, in carloads, $1.55; polished staples, $1.70; galvanized staples, $2.

Wire Rods.—Scattered sales of wire rods in lots of from 200 to 500 tons for delivery over the next two or three weeks are reported in this market on a basis of $28, Pittsburg, although this price is understood to have been shaded slightly on particularly desirable business. We quote Bessemer rods at $28, Pittsburg, and open-hearth rods at $28.50, Pittsburg.

Coke.—Three or four large consuming interests are negotiating for their furnace coke requirements over 1911. Two of these companies which require from 15,000 to 30,000 tons of coke a month have been buying in the open market since July 1. Several large contracts will expire this week, and sellers generally expect heavier buying during the first week in January for immediate shipment. A series of meetings is being held by producers in the Connellsville region to discuss matters in connection with the formation of the proposed central coke selling agency. Several producers who have been identified with this movement for some time announce that arrangements have been made for organizing the Fidelity Coal & Coke Co. with a capital of $300,000 to handle the output of approximately 7,000 ovens. Trading during the past week has been exceedingly light, although prices show little change. We quote standard Connellsville furnace coke, for prompt shipment, at from $1.45 to $1.50, ovens, and for first half at from $1.60 to $1.80, ovens. On high grade Connellsville foundry coke we quote $2, ovens, for prompt delivery; for first half at from $2.25 to $2.50, ovens. The Connellsville *Courier's* figures for the week ending Dec. 10, show 24,010 active ovens with an output of 292,435 tons, compared with 23,965 active ovens and a production of 289,668 tons the previous week.

Old Material.—There has been no important trading in this market during the week, and producers of scrap are offering very little material to dealers. Prices are not any lower than a week ago, but this is probably due to the fact that there is not enough trading to test the market. The lowest price at which actual sales of heavy melting steel have been made is $13.50, while some dealers continue to ask $14. We quote, gross tons, delivered in the Pittsburg district, including Monessen, Sharon, Steubenville, Brackenridge and Follansbee, as follows:

Heavy melting scrap	$13.50 to 14.00
Rerolling rails	14.50 to 15.00
Bundled sheet scrap	10.00 to 10.25
Iron axles	24.00 to 24.50
Old iron rails	15.00 to 15.25
No. 1 wrought scrap	14.00 to 14.50
Old car wheels	13.00 to 13.50
Low phosphorus	17.50 to 18.00
Machine shop turnings	9.00 to 9.50
Cast borings	8.50 to 8.75
No. 1 cast scrap	14.00 to 14.25
Malleable	14.00 to 14.50
Stove plate	11.00 to 11.50

CHICAGO

Slight Improvement in Shapes and Bar Iron—Prices are Firm.

Office of THE IRON TRADE REVIEW,
1328 Monadnock Blk., Dec. 27.

A little activity in structural materials and a slight improvement in bar iron are the only features which may be distinguished at present above the dead level of quiet which has settled down over the iron and steel trade in the middle west. Prices of finished materials continue to be very well maintained, market conditions considered, but pig iron is soft and old material perceptibly weaker. Persons well informed on the movements of the market do not expect any particular change in the situation until the new year is well under way. In some circles, quiet business is expected to extend throughout the first quarter. The causes for the hesitancy which has marked the closing months of 1910 are complex, but a large portion of the trouble is being ascribed to the lack of railroad buying, not only on account of the actual shrinkage in bookings traceable to this cause, but also on account of the general feeling of uncertainty which railroad inactivity has engendered.

Pig Iron.—The price of southern iron is firmly established on a basis of $11 for first quarter delivery and the trade is at present speculating on how long the advance of 50 cents a ton, which is being generally asked for shipments during the second quarter and beyond, can be maintained. At present, there is no evidence in this market of sales at $11 for delivery beyond the month of April. Northern iron is very quiet and buyers are showing very little interest in the market. While nominal quotations of northern iron are being maintained on a basis of $16, Chicago, for No. 2 foundry, there is little doubt that heavy inquiries would bring out lower figures. In fact, we note a sale of a moderate tonnage of No. 1 iron at $16.25, equivalent to $15.75 for No. 2. The knowledge that close prices may be obtained does not seem to be influencing buyers to make inquiry. The market in general is practically devoid of activity.

We quote the market, f. o. b. Chicago, as follows:

(Prompt shipment and first quarter.)

Lake Superior charcoal	$17.50 to 18.00
Northern foundry No. 2	16.00 to 16.50
Southern foundry No. 2	15.35 to 15.85
Southern silveries, 5 per cent silicon	16.85 to 17.35
Jackson Co. silveries 8 per cent	19.40
Malleable Bessemer	16.00 to 16.50
Alabama basic	15.35 to 15.85

Billets.—A year ago, there was a veritable famine in the Chicago billet market. Conditions are absolutely reversed at present and makers are willing to make very favorable terms for orders involving even moderate tonnages. We quote, nominally, $27, Chicago, for open-hearth billets.

Merchant Bars.—Bar iron prices remain unchanged, but business has improved slightly. The records of the month will show that orders for bar iron received during December were about 10 per cent heavier than those taken in November. Were not the scrap market weakening, the outlook for profits from sales of bar iron would be very gloomy, but with business increasing a little and the prospect of firmer quotations in sight, together with especially low prices for raw material, conditions in the iron bar trade are probably more favorable than in most other lines. Prices on steel bars are being maintained, but business is very light and store business is only fair.

We quote, Chicago delivery, as follows:

Bar iron, 1.32½c to 1.37½c; hard steel bars, re-rolled, 1.40c to 1.50c; soft steel bars and bands and small shapes, 1.58c to 1.63c; base; hoops, 1.73c to 1.83c; planished or smooth finished tire steel, 1.78c to 1.83c, base; iron finished tire steel, 1.73c, base; smooth finished machinery steel, 1 inch and larger, 2.43c; spring steel, 2.28c; crucible spring steel, 2.78c; tool steel, 7c to 9c, with higher prices for special grades. Quotations on shafting are 55 per cent off the list for carload lots, and 50 per cent off for less than carload lots, carload freight allowed to points in base territory.

On iron and steel from local stock, we quote, f. o. b. Chicago, as follows:

Bar iron, 1.80c to 1.90c, per pound base; soft steel bars, 1.80c to 1.90c per pound base; soft steel hoops, 2.10c to 2.20c, full extras.

Structural Material.—A few fabricating contracts are reported in this market, the business being confined principally to the far northwest. The Bon Marche, Seattle, has let a contract to the Vulcan Iron Works, Seattle, for the fabrication of a new building which will require 1,450 tons of structural material. It is probable that some of this steel will be imported. Stone & Webster, of Boston, are in the market for 1,500 tons of steel for a pipe line involved in a hydro-electric project which is being developed near Seattle. Well informed interests anticipate a heavy demand for structural material in the city of Vancouver, B. C., during the spring, it being estimated that buildings requiring about 30,000 tons will be erected within the near future. Plain material is moving slowly, but prices are well maintained at present. We quote, mill prices, for structural shapes, f. o. b. Chicago, as follows:

Beams and channels, 15 inches and under, 1.58c to 1.63c. For extras, see Pittsburg report.

Store prices, f. o. b. Chicago, are as follows:

All angles, 3 inches and larger, including 6 inches, $1.80 to $1.90 per 100 pounds; angles over 6 inches, $1.90 to $2 per 100 pounds, base; beams, 3 to 15 inches, inclusive, $1.80 per 100 pounds, base; channels, 3 inches and larger, $1.80 per 100 pounds, base.

Rails and Track Supplies.—There has been no change in the situation in this territory and further purchases of rails by western trunk lines are not expected until well into next year. The Christmas shut-down this year will probably be longer than usual.

See Pittsburg reports for prices on standard sections. We quote light rails and track supplies, Chicago delivery, as follows:

Light rails, carloads, 40 to 45-pound, 1.16c to 1.20½c; 30 to 35-pound, 1.19½c to 1.24c; 16, 20 and 25-pound, 1.20½c to 1.25c; 12-pound, 1.25c to 1.29½c.

Light section relayers, 45 pounds and under, subject to inspection, $21 to $23; standard section re-laying rails, subject to inspection, $23.50 to $24.

Track supplies, f. o. b. Joliet, angle bars, 1.50c to 1.60c; railroad spikes, 1.65c to 1.70c; smaller size spikes, 1.70c, base; track bolts with square nuts, 2.20c to 2.30c, base.

Plates.—The market is very quiet and while some interests are still quoting 1.35c on comparatively narrow plates, the number of mills making this figure has been perceptibly reduced and 1.40c may be said to represent the general level of the market, although there is not enough business in this territory thoroughly to test prices.

We quote, Chicago delivery, as follows:

Tank plates, ¼ inch thick, 6¼ to 100 inches wide, 1.58c to 1.63c. For extras, see Pittsburg report.

Store prices, f. o. b. Chicago, are as follows:

Tank steel, ¼ inch and heavier, up to 72 inches wide, 1.80c to 1.90c; from 72 inches to 96 inches wide, 1.90c to 2c; 3-16 inch up to and including 60 inches wide, 1.90c to 2c; 72 inches, 2.15c to 2.25c; No. 8, up to 60 inches wide, 1.95c to 2.05c. Flange quality and heads, 25c extra.

Sheets.—Sheet mill operations remain unchanged and the market presents no new features. New business is coming in slowly to the mills, but store business is fairly good. Some increase in specifications is expected as soon as the inventory period is over and jobbers commence to order for their spring trade.

We quote, store prices at Chicago, as follows:

Blue annealed No. 10, 2.10c to 2.20c; No. 12, 2.15c to 2.25c. Box annealed, No. 28, 2.75c to 2.85c. Galvanized, No. 28, 3.65c to 3.75c.

For mill prices, see Pittsburg report. Freight to Chicago, 15 cents.

Wire Products.—The agricultural demand for wire products continues to be notable. Otherwise the market is quiet. Until after the stock-taking period, specifications for nails, plain wire, etc., are expected to be light.

We quote, f. o. b. Chicago, as follows:

Wire nails, jobbers' carload lots, $1.88; retailers' carload lots, $1.93; retailers' less than carload lots, $2.03; painted barb wire, jobbers' carload lots, $1.88; retailers' carload lots, $1.93; retailers', less than carload lots, $2.03; with 30c for galvanizing; plain wire to jobbers, $1.68; plain wire, retailers' carload lots, $1.73; staples, bright, $1.88.

Merchant Pipe and Tubes.—The market for merchant pipe is very dull. A suspension of building operations on account of the holidays makes the demand unusually light. The market for boiler tubes is fair. A new seamless tube mill with a capacity of 2,000 tons per month will be placed in operation by the Globe Seamless Steel Tubes Co., at Milwaukee, early next year, probably about Feb. 1.

We quote, iron and steel pipe and tubes out of store, as follows:

Iron and Steel Pipe Basing Price.

	Steel. Black.	Steel. Galv.	Iron. Black.	Iron. Galv.
⅛-¾ inch	68.2	53.2	62.2	47.2
½ inch	71.2	58.2	65.2	52.2
¾ inch	76.2	65.2	71.2	60.2
4½-6 inches	73.2	62.2	69.2	58.2
7-12 inches	70.2	53.2	66.2	49.2
EXTRA STRONG PLAIN ENDS.				
½ inch	69.2	62.2	....	....
¾ inch	74.2	67.2	....	....
⅛ inch	64.2	....	....	....
DOUBLE EXTRA STRONG.				
½ inch	57.2	49.2	....	....
¾ inch	62.2	54.2	....	....
⅛ inch	52.2	40.2	....	....

Tubes.

	Lap weld steel. Per cent.	Charcoal iron. Per cent.	Shelby seamless. Per cent.
1 inch	..	..	57½
1¼ to 2¼ inch	50	35	35
2¾ to 5 inch	60	48	46

Cast Iron Pipe.—Some specifications for gas pipe continue to be received. Otherwise the market is dull and only routine orders are being received. Winter business in water pipe is developing slowly.

We quote, f. o. b. Chicago, as follows:

Four-inch water pipe, $27; 6 to 12 inches, $26; larger sizes, $25; gas pipe, $1 a ton higher.

Old Material.—The market has weakened further under pressure and new low prices are recorded. Arch bars have been cut to $14 net ton,

shafting to $15.75 and re-rolling rails to $13.75. Prices of other items have been reduced to a lesser extent. The Chicago & Eastern Illinois railroad is offering a list amounting to 213 tons, on which bids will close Dec. 29.

We quote the market, f. o. b. Chicago, as follows:

GROSS TONS.

Old car wheels	$12.00 to 13.00
Old iron rails	15.50 to 15.75
Rerolling rails (5 ft. and over)	13.75 to 14.25
Old steel rails (3 ft. and under)	12.50 to 13.00
Frogs, switches and guards	11.75 to 12.25
Heavy melting steel	11.75 to 12.25
Shoveling steel	12.00 to 12.25

NET TONS.

No. 1 R. R. wrought	$11.50 to 12.00
No. 2 R. R. wrought	10.50 to 11.00
Arch bars and transoms	14.00 to 14.50
Knuckles, couplers and springs	11.50 to 11.75
Shafting	15.75 to 16.25
Iron car axles	18.25 to 18.75
Steel car axles	17.75 to 18.25
Locomotive tires	16.00 to 16.50
Dealers' forge	10.50 to 11.00
Pipes and flues	8.50 to 9.00
No. 1 cast, 150 lbs. and less	11.75 to 12.25
No. 1 busheling	9.50 to 10.00
No .2 busheling	7.50 to 8.00
No. 1 boiler cut	8.75 to 9.25
Boiler punchings	14.25 to 14.75
Cast and mixed borings	5.00 to 5.50
Machine shop turnings	6.50 to 7.00
Railroad malleable	11.00 to 11.50
Agricultural malleable	11.00 to 11.50
Stove plate and light cast scrap	11.00 to 11.50
Angle bars, splices, etc., iron	13.25 to 13.75
Angle bars, steel	11.25 to 11.75

CLEVELAND

Inquiry From a Cast Iron Pipe Company.—Market Very Quiet.

Office of THE IRON TRADE REVIEW,
Penton Building, Dec. 27.

Iron Ore.—Reports that reservations of ore have been made are not true so far as any real activity in the market is concerned. In many cases the relations of ore companies to manufacturing concerns are so close that it is well understood that the latter will obtain their supply from the former, and that is the case this year, but no transactions which could be described as actual contracts have taken place.

On base ores with the guarantee of 55 per cent on old range and Mesabi Bessemer, and 51½ per cent on old range and Mesabi non-Bessemer, we quote as follows: Old range Bessemer, $5; Mesabi Bessemer, $4.75; old range non-Bessemer, $4.20; Mesabi non-Bessemer, $4.

Pig Iron.—It is understood that on sales of spot iron $14 Cleveland has been shaded, but sales have been extremely limited. The only inquiry of importance is for 1,000 tons per month throughout next year for a cast iron pipe company at Coshocton, O. We quote delivered in Cleveland for the first half of next year as follows:

No. 1 foundry	$14.75
No. 2 foundry	14.25
No. 2 Southern	15.35
Gray forge	14.00
Bessemer	15.90
Lake Superior charcoal	18.00
Jackson Co. 8 per cent silvery	19.00

Some time ago, owing to the very low prices at which basic was being sold, a movement was started to associate manufacturers of basic pig iron in the Mahoning and Shenango valleys, in such a manner that the product of all their furnaces could be sold through a central agency. One important interest, however, declined to unite with the others and difficulty was experienced in getting a manager of sales. Hence, it seems extremely doubtful at the present time whether any united action will be taken.

Coke.—It develops that an inquiry for 1,000 tons of foundry coke for delivery next year was made to determine the price for inventory purposes. The market is quiet, and prices unchanged.

Connellsville furnace coke, $1.45 to $1.50 for prompt delivery, and $1.60 to $1.80 for first half next year. Connellsville foundry coke, $2 to $2.10 for prompt, and $2.25 to $2.50 for first half of next year.

Finished Material.—The present year has been marked by a very fair amount of new construction, especially in the way of erecting buildings in the Euclid avenue business district, and the prospect is that next year will make an even more favorable showing. If a considerable part of the municipal, county and railroad work is carried on as planned, a large tonnage of structural steel will be required. At present, the finished material market is extremely dull. Prices seem to be well maintained in spite of some rumors of concessions. There is not, however, enough business to test prices. The Ford Glass Co., Toledo, has not yet awarded the contract for 1,100 tons of structural material for which bids were received last week.

Old Material.—Dullness that has pervaded this market for the past three weeks continues. Very little material is moving, the mills in the city still refusing to snap at most any sort of price bait offered. There is no improvement in the feeling throughout the district. An offer of 1,000 tons of iron rails by the Michigan Central has lowered the price 50 cents a ton. Prices have shown little change and quotations, gross tons, f. o. b. Cleveland, are as follows, being nominal:

Old iron rails	$15.00 to 15.50
Old steel rails (under 6 ft.)	13.50 to 14.00
Old car wheels	12.00 to 12.50
Old steel boiler plate	10.00 to 10.50
Malleable iron (railroad)	13.25 to 13.75
Steel axles	19.50 to 20.00
Malleable iron (agricultural)	11.50 to 12.00
Heavy steel	12.75 to 13.25
Country mixed steel	11.75 to 12.25

We quote, net tons, as follows.

No. 1 R. R. wrought	$12.50 to 13.00
No. 1 busheling	11.00 to 11.50
No. 1 machine cast	12.00 to 12.50
Axle turnings	9.00 to 9.50
Machine shop turnings	6.00 to 6.50
Grate bars	10.00 to 10.50
Pipes and flues	9.00 to 9.50
Tank iron	8.00 to 8.50
Sheet iron	4.00 to 4.50
Wrought drillings	6.00 to 6.50
Cast borings	6.00 to 6.50
Stove plate	10.00 to 10.50

CINCINNATI

Very Little New Business Develops in Pig Iron Market.

Office of THE IRON TRADE REVIEW,
Room 11, Blymyer Bldg., Dec. 27.

Pig Iron.—The holiday dullness is now at its height and a general state of quietness pervades the pig iron market. Scarcely any new business has come out during the week, excepting a few scattering sales for special requirements. Selling agencies expect little change in conditions before the middle of next month, when it is thought there will be an increased demand and the situation become more responsive. It is quite probable that production will be considerably curtailed as a result of holiday festivities, which should have a beneficial effect on market conditions, thereby allowing stocks on furnace yards to show slight decrease. As a matter of fact, such a small tonnage of iron has been sold during the week that it becomes difficult to state what prices are, yet it is generally conceded that $11.00, Birmingham, and $14.00, Ironton, are the ruling quotations, and represent selling prices of most of the standard brands for any delivery prior to July next. Pipe-making interests, who have recently been rather active in buying large blocks of the lower grades, have apparently secured sufficient for immediate requirements and are not at the present time aggressive. Stove and range interests have probably bought the bulk of the iron required for present contracts, and will wait until later before entering into further negotiations. Silvery grades are quiet and prices are somewhat unstable and weak. Local foundry interests are only moderately busy, as the demand for castings from the machine tool plants is now considerably below normal and will likely continue so until the shops have recovered from inventories and general repairs incident to the season. We quote prices based on freight rate of $3.25 from Birmingham and $1.20 from Ironton for prompt and through the first half of 1911 as follows:

	1910.	First half 1911.
Southern foundry No. 1	$14.75	$15.25
Southern foundry No. 2	14.25	14.75
Southern foundry No. 3	13.75	14.25
Southern foundry No. 4	13.75	14.25
Southern No. 1 soft	14.75	15.25
Southern No. 2 soft	14.25	14.75
Southern gray forge	13.75	14.25
Northern No. 1 foundry	15.70	15.95

Northern No. 2 foundry	15.20	15.45
Northern No. 3 foundry	14.70	14.95
Jackson county 6 per cent silicon		18.20
Jackson county 8 per cent silicon	19.20	19.70
Jackson county 10 per cent silicon		20.20

Coke.—Quite a number of contracts for foundry brands will expire during the early part of the month, which will aggregate considerable tonnage. Last year at this time, there was a disposition on the part of operators to avoid entering into contracts for a late period in the future, and it is expected that some good business will result from this within the next two or three weeks. Furnace brands have settled somewhat and the demand is more quiet. During the past week, several contracts that were pending were closed that embraced blocks aggregating several thousand tons per month. We quote prices from the leading coke producing districts as follows:

Connellsville district:	Prompt Shipment.	First half.
Foundry coke	$2.00 to 2.25	$2.25 to 2.50
Furnace coke	1.50 to 1.60	1.75 to 1.85
Wise county district:		
Foundry coke	2.00 to 2.25	2.15 to 2.25
Furnace coke	1.45 to 1.60	*Sliding [scale basis.
Pocahontas district:		
Foundry coke	2.00 to 2.10	2.10 to 2.25
Furnace coke	1.65 to 1.75	1.75 to 1.85
New river:		
Foundry coke	2.50 to 3.25	2.60 to 3.25
Furnace coke	2.20 to 2.30	2.20 to 2.30

*Sliding scale basis means $1.60 for coke based on $9, Birmingham, for pig iron, with an advance of 16 2-3 per cent of the amount over $9 at which pig iron is quoted. This is the usual basis. Other forms of sliding contracts are also made.

Finished Material. — Plates, shapes and bars are quotable at 1.40c, Pittsburg. It is generally conceded that the past year has been above expectations and in many ways satisfactory. At this period last year, considerable tonnage was being delivered on contract at prices below present quotations, which indicates a higher basis for comparison and increased revenues. Local structural demand is quiet and no specifications of any consequence are pending.

Old Material.—The market for scrap is exceedingly quiet and presents no feature of interest. Dealers expect little change in the near future, yet are forwarding shipments on contract promptly. The mills are quiet, as is customary at this time of the year, and are doing little in the way of new contracts. Dealers say that prices are unsteady and show considerable fluctuation. The following schedule is said to about represent open quotations:

Old No. 1 R. R. wrought, net tons	$10.50 to 11.00
No. 1 machinery, net	10.00 to 10.50
No. 1 busheling, net	10.00 to 10.50
Old iron rails, gross	16.00 to 16.50
Old steel rerolling, gross	15.50 to 16.00
Old short lengths, gross	14.50 to 15.00
Old iron axles, net	18.00 to 18.50
Heavy melting scrap, gross	11.00 to 11.50
Stove plate, net	8.00 to 8.50
Heavy turnings, net	6.00 to 6.50
Cast borings, net	4.50 to 5.00
Car wheels	13.00 to 13.50
Grate bars	8.50 to 9.00

PHILADELPHIA

Low Malleable Prices Reported.—N. & W. Bridge Up for Figures.

Dec. 27.

Pig Iron. — Christmas week has brought greater quietness to the pig iron market in the eastern district, but there has been a fair volume of additional iron placed including pipe iron, mill grades and some malleable. Pipe iron continues in the most active demand and sales of the week have probably amounted to 5,000 tons, principally southern iron. In this was included some warrant iron for immediate shipment upon which a low price is reported to have been obtained at cash terms. The leading cast iron pipe interest is figuring with makers on a round lot for forward shipment to this territory and another smaller eastern pipe foundry, which usually buys in 1,000 to 5,000 ton lots, is out to cover some of its requirements. Other users of this class are following their usual plan of picking up odd lots for nearby delivery, but there seems to be a greater disposition to consider first quarter requirements, upon which a favorable construction is laid by sellers as indicating the belief that prices are near bottom. A leading malleable consumer in this district has closed for 1,000 tons of this grade for first half at a low delivered price, understood to be a shade under $16 delivered or $13.50 at distant furnaces. Smaller lots were also sold around this level. Valley malleable at $14 furnace, which was quoted on some of this business, is held at $16.65 delivered. An aggregate of about 1,000 tons of mill forge in lots of 300 tons and less was sold at $14.50 delivered or $14 furnace. Although one basic buyer continues to sound the market, offering from $14 to $14.25 delivered with no acceptances, it is not believed there is much prospective business for the near future in this grade. Most consumers have under contract considerable metal, which they have not yet been able to take in because of curtailed operations, and in some cases, stacks in consumers' hands are increasing. Recent general meetings of pig iron makers have again reflected the fact that the eastern district is probably in the best condition at present of any iron producing territory of the country. Stocks are less than 100,000 tons, representing not more than a 15 days' capacity make and current output is down to about 50 per cent.

For prompt and first quarter shipment, we quote delivered in Philadelphia and vicinity as follows:

No. 1X foundry	$16.00 to 16.25
No. 2X foundry	15.50 to 15.75
No. 2 plain	15.00 to 15.50
Standard gray forge	14.25 to 14.50
Basic	14.50 to 14.75
No. 2X Virginia	15.65 to 15.80
No. 2 Southern	15.00 to 15.50
Low phospnorus	22.50

Finished Material.—Some consumers, especially of plates, are closing for their first quarter requirements at 1.40c Pittsburg, but others are inclined to move slowly until general conditions are more settled. In shapes, the statement is advanced by makers that the 1.40c Pittsburg price is being more universally held than was the case when quotations for this material were at higher levels. The finished market continues quiet.

Prospective railroad awards are getting into more definite shape. The Norfolk & Western railroad will take bids Jan. 15, for a bridge across the Ohio river at Kenova, W. Va., which will require a large tonnage, estimated at 10,000 tons or more. This contract is a part of the large bridge requirements of this road, which have been referred to recently on several occasions. The Chesapeake & Ohio is still considering the proposition of closing for a large tonnage of shapes for car underframes. The Phoenix Bridge Works is low on a 700-ton Scherzer lift bridge, for the Southern railroad in southern territory. Another recent order placed with the Baldwin Locomotive Works calls for 24 locomotives.

In other lines, two freight boats requiring about 2,000 tons will soon be placed with eastern shipyards. The government is taking bids on 1,200 tons of twisted steel bars for Panama. Bethlehem sections are specified in the new building for the department of printing and engraving at Washington, while the form of the columns is optional. About 200 tons of Bethlehem sections will go into the new Scottish Rite temple at Washington, closing Jan. 4. In this city the Packard Motor Car Co. building is on the verge of being placed, the Alexander Bros. building is still pending and the Smaltz building, 200 tons, is up.

Reports that bar iron makers are cutting into the steel bar business, have apparently applied in a very limited way to this district. Bar iron prices nevertheless continue very low and are considerably below steel bars, some quotations of 1.25c mill or 1.32c Philadelphia being made. Steel bars at 1.40c Pittsburg, are 1.55c Philadelphia.

We quote for delivery in Philadelphia and vicinity as follows:

Structural shapes, 1.55c to 1.60c; steel plates, 1.55c to 1.60c; steel bars, 1.55c to 1.60c; iron bars, 1.32c to 1.37c; 4 x 4-inch open-hearth rolling billets, $25, eastern mill; foreign billets, $27, eastern mill.

Old Material.—Dullness continues the predominant note of scrap conditions. In the tonnage grades, heavy steel is at the top at $12.50, delivered, and railroad wrought at $16, delivered, with light selling. Reports of some heavy steel and car wheels being engaged for export do not apply to Philadelphia territory, as this port is too close to the domestic consuming area to make such traffic profitable. Present scrap prices at Boston and some New England ports and at some southern points are said to be low enough, however, to make European exports possible at this time. We quote, gross tons, delivered in eastern Pennsylvania consuming territory, as follows:

Old steel rails (re-rolling)	15.75 to 16.25
Heavy melting steel	12.50 to 12.75
Old car wheels	13.75 to 14.25
Old iron car axles	25.00 to 26.00
Old steel car axles	20.00 to 21.00
No. 1 railroad wrought	16.00 to 16.50
Wrought pipe	12.75 to 13.00
Cast borings	8.25 to 8.50
Wrought turnings	8.25 to 8.50
Heavy cast scrap	14.00 to 14.50
Railroad malleable	13.50 to 14.00
Stove plate	10.50 to 11.00

ST LOUIS

Inquiries Are Small, While Sales Are Few and Insignificant.

Dec. 27.

Pig Iron.—Local sales agents have about despaired of new business until the year has well turned and stock taking has been completed. Inquiries are only for small lots for immediate shipment, and sales have been few and for insignificant tonnages during the last few days. Quite a number of purchasers have notified salesmen not to make shipments until they have finished taking stock. Southern No. 2 iron is readily obtainable at $11, Birmingham, and $11.50 is the highest price mentioned for future shipments. Quotations on southern iron, delivered, to which the Birmingham freight of $3.75 has been added, remain nominally as follows:

Southern No. 1	$15.50 to 16.00
Southern No. 2	15.00 to 15.50
Southern No. 3	14.50 to 15.00
Southern No. 4	14.00 to 14.50

Coke.—What has been said of pig iron pertains to coke, so far as a dull market and little prospect of an early improvement. Prices remain as follows:

We quote 72-hour Connellsville foundry grades, $2.35 to $2.50 for whole of 1911; 72-hour foundry, $2 to $2.25, on tracks and for immediate delivery; 48-hour Connellsville furnace, $1.60 to $1.85; best 72-hour Virginia foundry, $2 to $2.35; 48-hour Virginia furnace, $1.60 to $1.85. The freight to East St. Louis and St. Louis is $2.80, and $2.70 from the Virginia fields when shipment is destined beyond St. Louis.

Old Material.—Prices on scrap remain nominally as follows, with no transactions worthy of note reported, and little prospect for business in the near future:

Old car wheels	$13.50 to 14.00
Old iron rails	14.50 to 15.00
Rerolling rails (4 ft. and over)	13.00 to 13.50
Old steel rails (2 ft. and under)	12.00 to 12.50
Light section relayers, 45 lbs. and under, subject to inspection	21.00 to 23.00
Relaying rails, subject to inspection	24.50 to 25.00
Frogs, switches and guards	12.00 to 12.50
Heavy melting steel	12.00 to 12.50
Shoveling steel	12.00 to 12.50

We quote, net tons, as follows:

No. 1 R. R. wrought	$11.50 to 12.00
No. 2 R. R. wrought	10.50 to 11.00
Arch bars and transoms	14.00 to 14.50
Knuckles, couplers and springs	12.00 to 12.50
Shafting	15.00 to 15.50
Iron car axles	18.50 to 19.50
Steel car axles	18.50 to 19.50
Locomotive tires	14.50 to 15.00
No. 1 country wrought	9.50 to 10.00
Pipes and flues	9.00 to 9.50
No. 1 cast, 510 lbs. and less	12.00 to 12.50
No. 1 busheling	10.25 to 10.75
No. 2 busheling	7.00 to 7.50
No. 1 boiler cut	9.00 to 9.50
Boiler punchings	10.25 to 10.75
Cast and mixed borings	5.00 to 5.50
Machine shop turnings	7.00 to 7.50
Railroad malleable	10.00 to 10.50
Agricultural malleable	9.00 to 9.50
Stove plate and light cast scrap	9.50 to 10.00
Angle splice bars, iron	13.25 to 13.75
Angle splice bars, steel	12.00 to 12.50

BUFFALO

Furnacemen Deny Reports of Cut Prices for Buffalo Iron.

Dec. 27.

Pig Iron.—Business continues dull, and a large part of the lack of inquiry is attributed to the inventory period and the holiday season. Some orders for iron have been placed, but they have been in small lots and not running far into 1911. The general opinion among representatives of the pig iron interests is that buyers are waiting until after the turn of the year. In spite of reports to the contrary iron men say that the schedule of prices announced some time ago is being maintained, and they deny the reports of substantial concessions coming from other points. We quote f. o. b. furnace as follows:

No. 1X	$15.00 to 15.50
No. 2X	14.50 to 15.00
No. 2 plain	14.50 to 14.75
No. 3	14.50 to 14.75
Gray forge	14.00 to 14.50
Malleable	14.50 to 15.00
Basic	14.50 to 15.00
Charcoal	17.75 to 18.25

Finished Products.—Business in all lines is almost at a standstill. The only sizable lettings during the past week have been for steel to be used in connection with canal contracts. It is believed that, on account of the talk there has been recently of lower prices, buyers are holding back until after the new year. But the stocks held by both jobbers and manufacturers are low as indicated by the demand for haste which accompanies almost every order placed.

Old Material.—Very little business is being done in this district, and prices are largely nominal. We quote gross tons, f. o. b. Buffalo, as follows:

Heavy melting steel	$12.25 to 12.50
No. 1 railroad wrought scrap	14.50 to 15.00
No. 1 railroad and machine cast scrap	13.50 to 14.00
Old steel axles	17.00 to 18.00
Iron axles	23.00 to 24.00
Car wheels	13.75 to 14.25
Railroad malleable scrap	13.75 to 14.00
Machine shop turnings	6.75 to 7.00
Cast iron borings	5.00 to 5.50
Low phosphorus steel scrap	17.00 to 17.50
Old iron rails	15.50 to 16.00
Tank iron	10.75 to 11.00
Sheet iron	6.50 to 7.00
Stove plate	12.00 to 12.50
Pipes and flues	10.25 to 10.75
Grate bars	11.50 to 12.00
Boiler plate	11.00 to 11.50

BIRMINGHAM

Buyers Generally Disposed to Await Further Developments.

Dec. 26.

Pig Iron.—An unusual quiet has prevailed in local pig iron circles during the past week, and practically nothing has transpired to change the aspect of conditions generally. The sale of several lots of 100 tons each for shipment immediately after Jan. 1 is reported and a basis of $11 per ton, Birmingham, is understood to have been maintained. A lot of 200 tons of high manganese iron for shipment over the first quarter was sold at $12.50 per ton Birmingham. The inquiry recently made in this market was of a rather indefinite nature and general disposition on the part of the buying interests to await further developments is evinced. One or more round tonnages of low grades are now pending, but, as was the case during the week previous, there is quite a difference in the views of the prospective buyers and producers in the matter of price. The fact that within the last fortnight a very attractive tonnage of cast iron water pipe has come forward for the producers of that material is being given considerable consideration by pig iron producers while the rate at which the output of pig iron has recently been reduced has had a decided tendency to strengthen the market for any deliveries extending beyond 30 days. It is generally believed that an $11, Birmingham, basis is now an attractive price for first quarter shipments and that deliveries to cover the entire first half would not be entered

at such figures. There seems no doubt that the tonnage on order books for forward delivery at the close of this year will be very small comparatively while stocks on melters' yards are certainly lower than on Jan. 1, 1910. The stock on furnaces' yards will probably be lower Jan. 1 next than on Dec. 1, but such a showing would not necessarily indicate a larger movement during the month of December than during November, as three furnaces on foundry iron have so far in this month been blown out.

Cast Iron Pipe.—The business transacted in this market during the week was very light without affording any test as to the strength of prices. It is now understood that a very attractive tonnage of water pipe will come up for letting early in the new year, but no specific information relative to the same is made public. The aggregate of all orders recently placed is very small comparatively and the average price received is very unsatisfactory to producing interests. We are not authorized to change quotations last published and we quote water pipe as follows per net ton f. o. b. cars here, viz: 4-inch to 6-inch, $18.50 to $19; 8-inch to 12-inch, $17.50 to $18, over 12-inch average $17, with $1 per ton extra for gas pipe. These prices are considered nominal, and are no doubt subject to shading for large contracts.

Old Material.—The movement during the past week was unusually light, owing to the closing down of mills for the holidays. The aggregate of sales is reported as very unsatisfactory and the inquiry has not come forward as has been expected. The offerings to dealers within the next 30 days are expected to be attractive, although those parties are disposed to pursue a very conservative course in the matter of additions. Dealers' asking prices are unchanged and we quote as follows per gross ton f. o. b. cars here:

Old iron rails	$13.50 to 14.00
Old steel axles	16.50 to 17.00
Old iron axles	17.00 to 17.50
No. 1 R. R. wrought	11.50 to 12.00
No. 2 R. R. wrought	10.50 to 11.00
Dealers' wrought	10.00 to 10.50
Old steel rails	11.00 to 11.50
No. 1 machinery	10.00 to 10.50
No. 1 steel	10.00 to 10.50
Old standard car wheels	12.50 to 13.00
Light castings, stove plate	8.50 to 9.00

The Columbia Steel Co., Elyria, O., has closed down its plant until after Jan. 1, to make some repairs and extensions to the boilers and equipment of the power plant.

After Jan. 1 the offices of the Best Mfg. Co. will be located at Oakmont, Pa., instead of Twenty-fifth street and the Allegheny Valley railroad, Pittsburg.

SEATTLE

Bright Outlook for Lumber Helps Prospects for Iron.

Dec. 23.

Pig Iron.—Very little pig iron was moved in this section this week, but several inquiries for the first quarter of next year were noted and will probably result in some heavy buying in the near future. The lumber trade, the barometer of the mill industry here, looks very optimistic for the new year and several large orders recently placed point to a decided improvement in conditions in that quarter. Among other inquiries recently placed is one for 3,500,000 feet of lumber by the government, to be used in the construction of the Panama canal, and several from the transcontinental railroads aggregating many million feet. There is an increase in buying among the mill men and this has a brightening effect on the foundry industry. This improvement in the demand for lumber will undoubtedly result in stiffening of prices. A raise in the lumber prices will be followed by the placing of more orders with the machinery dealers and foundries. Over 1,000 tons of foreign pig iron has been put on the market here in the past two weeks. This makes the dealers go slow in placing orders for more of the product in the immediate future. One thousand tons in this locality is considered a big amount for the general commercial trade, and will give the foundries a goodly supply for some time to come. The offering of No. 1 Southern in this market at prices that figure favorably with the imported article tends to make it harder to place orders for foreign iron.

We quote in gross tons foreign iron ex-ship Puget Sound or Columbia river, domestic, f. o. b. Pacific coast terminal, as follows:

No. 1 English Jarrow	$23.50 to 24.00
No. 1 Chinese Hanyang	23.50 to 24.00
No. 1 Cleveland	23.50 to 24.00
English Doncaster	23.50

First quarter, next year:

Eglinton	$23.50
Glengarnock	24.00
Cleveland	23.00
English Doncaster	23.00
English Jarrow	23.00
Hanyang	23.00

Sheets.—Little change was noted in the sheet market, although the dealers look for a general firming up after the new year. The commercial sheet market is active in supplying the building operations in the various coast cities and all concerned have large stocks on hand.

Bars.—Prices on common iron and soft steel took a small drop this week very unexpectedly. A decline of 10 cents was noted in these lines but this is expected to be returned in the near future. The dealers have a full stock on hand and quote the following prices:

Common bars 2.10c; soft steel, 2.30c; machinery steel, 2.95c; Norway iron, 4.25c; tees, over 3 inches, 2.85c; tees, less than 3 inches, 2.50c.

Wire Products.—This is probably the most active market in the Pacific northwest and shows no signs of falling off. The retailers in the ranching sections are still buying plain and barbed wire in large lots and the railroads have entered the market with good orders.

Wire nails, jobbers' carload lots, $2.45; retailers' carload lots, $2.50; retailers' less than carload lots, $2.60; painted barb wire, jobbers' carload lots, $2.45; retailers' carload lots, $2.50; retailers' less than carload lots, $2.60, with 30 cents for galvanizing; plain wire to jobbers, $2.25; retailers' carloda lots, $2.30; staples, bright, $2.45.

Old Material.—No change has been noted in the scrap market this week, following the general changes of last week. Dealers are still yarding considerable of their sales and are not entering into the market for much stuff.

Foundry scrap No. 1	$18.00 to 19.00
Foundry scrap No. 2	12.00 to 14.00
Old car wheels	15.00 to 16.00
Railroad wrought	10.00 to 12.00
Miscellaneous steel scrap	6.00 to 9.00
Grate bars	5.00 to 7.00
Stove plate	9.00 to 10.00

NEW YORK

All Branches of Market Quiet—Some Prices Are Soft.

Office of THE IRON TRADE REVIEW,
1115 West Street Bldg., Dec. 27.

Iron Ore.—In an informal way, some eastern furnaces are showing interest in probable ore prices for next season, but no definite moves have yet been made toward negotiating contracts, because both sellers and buyers are willing to let matters rest for a while on account of the unsettled state of the industry. Leading eastern domestic operators have as yet given no attention to prices for the coming season.

Pig Iron.—Holiday quietness surrounds the pig iron market and sales are small and very scattered. Little new inquiry is appearing and sellers are giving their attention mainly to the development of old business. A New Jersey buyer, who has been out for 1,500 tons, will probably close on a small portion of this lot this week, but has decided not to contract for the full tonnage because of the market's uncertainty. This consumer has been quoted quite uniformly $15.00, furnace, or $15.70, delivered, for 2.50 to 3 per cent silicon from eastern Pennsylvania makers, which

indicates that some reported low prices from that territory are not being freely made, at least upon the best known Lehigh and Schuylkill valley grades. Cast iron pipe companies are the most liberal buyers of pig iron in the eastern districts at the present time and a considerable tonnage is moving constantly to these interests. In connection with other lots, sales of about 2,000 tons of lower silicon northern grades to one of these companies are noted. Where it has been accompanied by equal tonnages of No. 3 and No. 2 grades, which are not so desirable for cast iron pipe practice, southern forge has been sold as low as $9.50, Birmingham, or $13.70, delivered in the east for early shipment, with the regular advances for the higher silicons. Quoted by itself, however, southern forge is held at $10.00, Birmingham. The Virginia situation continues to show price irregularity, although the largest maker is holding firmly at $13.00, furnace, for No. 2 and is refusing business at concessions. Virginia No. 2X iron has been recently offered in the trade as low as $12.50, furnace, equivalent to $15.30, Philadelphia or New York. The General Electric Co. is still negotiating for iron for New England plants and an up-state consumer has its inquiry for 2,000 to 3,000 tons of foundry iron still open, though it has made some small purchases. New England selling is in small lots and is very moderate. We quote for prompt and first quarter shipment, as follows:

Northern foundry No. 1	$15.75 to 16.00
No. 2X foundry	15.25 to 15.75
No. 2 plain	14.75 to 15.25
No. 2 Virginia	15.30 to 15.80
No. 2 southern foundry	15.25 to 15.75
Malleable	15.75 to 16.25
Gray forge	14.25 to 14.50

Coke.—A leading railway equipment interest is negotiating for its new year's requirements of foundry coke aggregating 4,000 to 8,000 tons for eastern and southern plants. Foundry coke is selling over a wide range according to grade at from about $2.20 to $2.50, oven. Some prompt lots of furnace coke continue to be taken at $1.50, ovens, and upward.

Ferro-Alloys.—Advices from abroad are that in the agreement of European makers of 50 per cent ferro-silicon to cut down production, sales will be made to joint account, indicating a uniform price. The market on neither ferro-manganese nor 50 per cent ferro-silicon shows much activity and pending business is light. Some sellers continue to openly quote $38.50, seaboard, on ferro-manganese, and one sale of 500 tons for first half at this price is noted, but $38.25 is available. We quote, 80 per cent ferro-manganese for prompt and forward shipment at from $38.25 to $38.50, seaboard, covering all deliveries, and 50 per cent silicon at from $55.00 to $56.00, Pittsburg.

Cast Iron Pipe.—The United States Cast Iron Pipe & Foundry Co. is the low bidder on the 3,760 tons of 3 to 36-inch pipe for the city of Baltimore. A number of pipe purchases by the New York department of water supply are being shaped, but are making slow progress through official circles. The market is showing no change. A fair tonnage is being offered, but prices invariably are extremely low. We quote 6-inch pipe at from $21.00 to $21.50, f. o. b. New York, in carload lots.

Finished Material.—December has been a light month in structural lettings, the total awards for that period being estimated at 60,000 tons, of which about 25,000 tons went to the American Bridge Co. and about 35,000 tons to the independents. New bookings in all finished lines are comparatively small and fresh offerings are limited.

Bids went in this week on 8,500 tons for the joint bridge of the city of Portland, Ore., and the Oregon Railroad & Navigation Co., which will cross the Wallamette river at Portland. A number of small bridges has also come out, including 300 tons for the Pennsylvania lines west, 400 tons for the New York Central, 150 tons for the New Haven and 300 tons for the Boston & Maine. This last named line also made some awards, including about 100 tons to the Phoenix Bridge Works and 370 tons to the Boston Bridge Works, while it still has pending about 2,000 tons in different small bridges.

The Bon Marche store at Seattle, Wash., 1,400 tons, has gone to the Vulcan Iron Works. Bids went in this week on 2,300 tons for the United States appraisers' stores at Boston. It is reported that the 2,500 tons for the Sloane building, New York City, will be fabricated by Levering & Gerrigues, but no definite announcement has been made. A new warehouse, New York City, for the Cruishank Co., will require about 2,000 tons. A report is current that the 3,000 tons for the new state prison of New York may be placed within a week or two, but this seems unlikely, as the matter is tied up by an injunction.

Locomotive orders of the week, officially reported, include 100 for the Boston & Maine railroad, of which 60 went to the American Locomotive Co. and 40 to the Baldwin Locomotive Works; 31 locomotives for the Soo Line to the American Locomotive Co. and eight locomotives for the New York, Ontario and Western to the American Locomotive Co.

We quote, New York delivery, as follows: Angles, 3 to 6 inches x ¼ inch and heavier, 1.56c to 1.61c; beams, 3 to 15 inches, 1.56c to 1.61c; tees, 3 x ¼ inch and heavier, 1.56c to 1.61c; plates, carload, tank, 1.56c to 1.61c; boiler steel, 1.66c to 1.71c; marine boiler, 1.96c to 2.01c; bar iron, 1.34c to 1.37c; soft steel bars, 1.56c to 1.61c.

Old Material.—The market is without any sizeable trading or firmness in prices. New sales are being made at lower levels in turnings and borings and in steel shafting. The steel mills will not pay over $12.50, delivered, for heavy melting stock and some consumers, not more than $15.00, delivered, for No. 1 railroad wrought. Nothing of importance has developed from the inquiry to New York dealers for heavy steel and car wheels for export to southern Europe. We quote, prices New York dealers will pay at tidewater, with the exception of cast scrap, which has a local demand, as follows:

Old car wheels	$12.00 to 12.50
Old iron axles	22.50 to 23.00
Old steel shafting	16.00 to 16.50
Heavy melting steel	10.50 to 10.75
No. 1 R. R. wrought	13.00 to 13.50
Iron track scrap	11.50 to 12.00
Wrought pipe	10.00 to 10.50
Cast borings	6.25 to 6.75
Wrought turnings	6.25 to 6.75
Heavy cast scrap	12.50 to 13.00
Railroad, malleable	12.50 to 13.00
Stove plate	9.00 to 9.50
Grate bars	9.00 to 9.50

Messrs. Crocker Bros., New York, Philadelphia, Pittsburg and Boston, have been appointed exclusive sales agents, effective Jan. 2, 1911, for the distribution of the several grades of foundry and forge pig iron produced by the Central Iron & Coal Co., of Tuscaloosa, Ala.

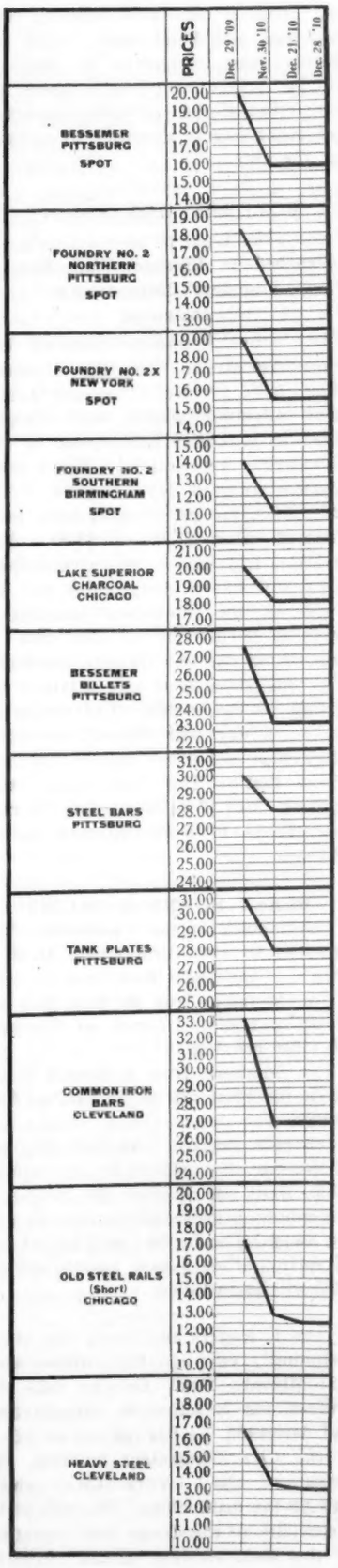
British Iron Market.

Clearing Away of Labor Troubles Starts Market Moving.

Office of THE IRON TRADE REVIEW, Prince's Chambers, Corporation St., Birmingham, Eng., Dec. 17.

The simultaneous completion of the general election and the settlement of the boilermakers' lockout have had an excellent effect on the market for raw materials. Buying has been general during the last two days, with prices steadily improving. Yesterday's quotation at Cleveland was 50s ($12.24), for prompt business, with 50s 6d ($12.36) for the first quarter of 1911, and 51s ($12.48) for the first half. There is a better disposition to do business than for a long time past. Consumers generally recognize that the time has come to cover their future requirements. The feature of the market in Birmingham on Thursday was the strength of pig iron, culminating in a general advance of quotations amounting to from 6d to 1s per ton. All Midland smelters have plenty of work on hand, and there are no stocks worth mentioning. For the present stocks in Middlesbrough continue to grow, the present amount

PRICE CHART



being 515,000 tons. This undoubtedly adds an element of weakness to the market, but in view of stock records, the amount is really not gigantic.

Finished Department.—It is many years since mid-December found the iron and steel trades so active as they now are. The mills are making full time, and producing a large output. The boilermakers' settlement, enabling so many shipyards to resume work, has had the immediate effect of overwhelming steelworks with specifications. Never in the history of the shipbuilding trade has there been such an accumulation of orders on the Clyde. For some reason, the railway companies continue rather poor buyers. Other branches of the steel trade are busy, and there is some difficulty in getting supplies. The tinplate trades continue very busy, with advances in price consequent upon a slight rise in the price of tin. A peculiar feature in recent months has been the heavy imports of steel bars and billets. At Cardiff alone in one week 15,000 tons of bars were received, the bulk of which came from America. Yet, the British mills are able to ignore this competition, owing to their excellent bookings, their mills still running to their full capacity.

METAL MARKETS

New York.

Dec. 27.

Copper.—The leading producers of copper metal are letting the market take care of itself, and further shading has been done on a light volume of business. Electrolytic has sold at 12.75c, delivered, 30 days, and 12.62½c cash, New York. These sales were mostly of metal held in second hands, and in small lots, hence they do not correctly indicate what the real strength of the copper metal situation is. It is most likely that should even a fair volume of inquiry develop, offers under 13c would quickly disappear. Due to the London exchange being closed from Dec. 23 to 28, no quotations were cabled to the New York Metal Exchange today, which intensified the local quietness. Up to Friday of last week a declining tendency prevailed in the foreign market.

The most favorable feature of the metal trade is the large total of exports since Dec. 1. Today's custom house returns raised the total to 26,519 tons.

Tin.—The fluctuations in the price of pig tin last week were not important after the decline on Wednesday, and the following advance which was manipulated on Thursday. Domestic consumers and dealers bought between 350 and 400 tons of pig tin during the early part of the week, but promptly retired from the market when their needs had been covered. In the absence of quotations from London since Friday, prices here have been altogether nominal. There is a difference of 50 points between the bid and asked figures.

The arrivals of tin since Dec. 1 aggregate 2,250 tons, and there are 1,953 tons afloat. It is probable sufficient additional arrivals will be reported in time for December delivery to increase the month's total to 2,500 tons. Deliveries into consumption will approximate 2,000 tons and reduce local stocks by something like 500 tons.

Lead.—The price of pig lead continues firm, but the demand appears to be light. The American Smelting & Refitting Co. controls the situation, and reports of a very optimistic character have come from that source recently. Outside business does not seem to justify them, however. The general asking price for New York delivery is 4.50c.

Spelter.—Very little consumptive demand has appeared in this market. The keen desire on the part of some recent bulls to secure what business there is has resulted in reducing the price to 5.65c in New York.

Antimony.—The antimony market continues unsettled. Cookson's is 7.50c; Hallett's is 7.50c, and Hungarian is 7c.

Chicago.

Dec. 27.

New Metals.—Business for copper continues fair, most of the orders being for immediate delivery. Spelter is weaker and carload lots are now quoted at 5.50c, Chicago, but this could very likely be shaded if any considerable tonnage were involved. Lead remains stationary and quiet. Tin has weakened slightly and is now quoted 38¾c, Chicago.

We quote, dealers' selling prices, f. o. b. Chicago, as follows:

Lake copper, carload lots, 13⅛c; casting, 12⅞c to 13c; smaller lots, ¼c to ⅜c higher. Spelter, car lots, 5.50c to 5.55c; lead, desilverized, 4.45c, in 50-ton lots; corroding, 25c per 100 pounds higher; sheet zinc, $7.75 list, f. o. b. La Salle, in car lots of 600-pound casks; pig tin, 38¾c; Cookson's antimony, 9½c; other grades, 9c to 10c.

Old Metals.—The market indicates very little change and December will close with business very quiet. Not much revival of activity is expected until after the close of the year.

We quote, dealers' selling prices, f. o. b. Chicago, as follows:

Copper wire, 11¼c; heavy copper,

11¼c; light copper, 10½c; heavy red brass, 10⅜c; heavy yellow brass, 8c; light brass, 6¼c; No. 1 red brass borings, 9¼c; No. 1 yellow brass borings, 6½c; brass clippings, 8c; tea lead, 3.80c; lead scrap, 4¼c; zinc, 4¾c; tin pipe, 32.5c; tin foil, 29.5c; pewter, 23.5c; electrotype plates, free from wood, 4½c; electrotype dross, 3c; stereotype plates, 4½c; stereotype dross, 3¼c; linotype dross, 3¼c; prime slab zinc dross, $85 per ton.

St. Louis.

Dec. 27.

Lead and Zinc.—Extra choice lots of zinc blende sold as high as $45 a ton in the Missouri-Kansas-Oklahoma district last week, although the bulk of the ore sold for $40, 60 per cent grades down to $38 basis, with an occasional rumor that $42 has been realized. The low price of ore was largely induced by the decline in spelter, which went to 4.37½c, East St. Louis, toward the close of the week. While zinc blende declined, calamine was stronger, 40 per cent qualities bringing from $22 to $25 a ton, with a top price of $32 a ton for choice grades.

Lead ore was reported stronger at $58 a ton. Pig lead at East St. Louis sold for 4.37½ to 4.40c. It is believed that the zinc and lead productions in the Missouri-Kansas-Oklahoma district for the year will reach a total valuation of more than $14,000,000. Many of the mines closed Saturday in observance of the Christmas holidays.

MONTHLY ORE RECEIPTS.

Considerable interest attaches to the monthly ore receipts at Lake Erie ports. During the past season THE IRON TRADE REVIEW has compiled them monthly, but instead of publishing separately the November and December receipts, incorporated them in the total receipts for the season. So many requests have been made for them as separate units that hereafter they will be kept separately. The ore receipts at Cleveland for November were 513,154 gross tons and for December 75,617 gross tons.

DAMAGE QUICKLY REPAIRED.

The fire damage sustained by the Washington, Pa., rolling mills of the Jessop Steel Co., on Dec. 14, has been made good, repairs both to building and mill equipment having been completed. The plant is now operating as before the fire.

The Vulcan Detinning Co. has declared the usual quarterly dividend of 1¼ per cent on its preferred stock, payable Jan. 20.

CHANGE OF NAME

Of Springfield, O., Concern to The Bauer Brothers Co.

In order to perpetuate the name of "Bauer," which has been prominently identified with manufacturing interests of Springfield, O., for many years, the name of The Foos Mfg. Co. will be changed to The Bauer Brothers Co., the change to become effective Jan. 1. The brothers are Charles L., Louis E. and William A. Bauer.

Their father, Charles A. Bauer, went to Springfield in 1874, identified himself with manufacturing, in 1883 became general manager of the Warder, Bushnell & Glessner Co. and continued to hold that office until his death in 1899. His oldest son, Charles L., who had been his father's assistant, succeeded him and in 1903 became a member of the executive committee of the American Seeding Machine Co. in charge of manufacturing. He resigned in 1904 to join his brothers in the purchase of the Foos interests. He made an excellent record as receiver of the Oscar Lear Automobile Co., to which he was appointed early in 1909; in 15 months placing the business on a sound basis, and finally reorganizing it as The Kelly Motor Truck Co. Louis E. and William A. Bauer have been identified with successful manufacturing for years, the former in charge of manufacturing and the latter with the auditing and financial end of the business. W. E. Copenhaver has been identified with the company since 1893 and has entire charge of the sales departments.

After the name of the company is changed, the officers will remain as they have since 1904: President, Charles L. Bauer; vice president, Louis E. Bauer; treasurer, W. A. Bauer; secretary, W. E. Copenhaver.

CREDITORS' COMMITTEE PLAN BEING WORKED OUT.

The plan of the creditors' committee of the Westinghouse Machine Co., which was submitted to all noteholders by circular letter issued Dec. 1, has been approved by 95 per cent of these noteholders in amount of obligations. It is also stated that the holders of quite a large amount of the notes have already expressed their intention to accept the new bonds in payment of the notes, as provided in the plan of the creditors' committee, instead of granting the extension of the notes for an additional three years. The plan worked out for the noteholders has for its object not only a better security for the obligations represented, but the creation of a mortgage security at 6 per cent, which will appeal to investors and make a new issue more easily negotiable. The stockholders' meeting called to authorize the creation of the proposed new mortgage and bond issue, which has already been adjourned to Dec. 29, will be further postponed to await the completion of the mortgage agreement and other papers essential to carrying out the plan.

MOLDERS' AGREEMENT

Reached in Chicago With Stove Founders' Defense Association.

The Stove Founders' National Defense Association and the Molders' union have arrived at a new agreement affecting wages and working hours in foundries represented in the Founders' association. The wage advance granted is not quite 5 per cent, since the percentages have been changed from $1.25 to $1.30. The molders had asked for a nine-hour work day, but a compromise was arrived at, the Founders' association agreeing to deliver the last ladle of iron within one and three-fourth hours after the seven-hour day allotted for setting up the molds. The length of the work day will depend, therefore, upon how soon the molder finishes after that. The agreement was reached Dec. 17 at a meeting of representatives of both organizations in Chicago.

BLAST FURNACE NOTES.

No. 2 stack of the Vanderbilt, Ala., furnaces of the Birmingham Coal & Iron Co. has been blown out.

The Republic Iron & Steel Co. has blown out No. 3 stack at Thomas, Ala., for relining.

The Southern Iron & Steel Co. has taken the blast off its Trussville, Ala., furnace.

Jefferson furnace, Oak Hill, O., one of the last charcoal stacks in southern Ohio, went out of blast the middle of the month because of the in-wall giving away. The furnace will be out until spring, when a new hearth and in-wall will be installed.

John I. Rogers announces that since resigning a year ago his position with the Midvale Steel Co. to take up professional practice in consultation and designing, he has opened an office in the City Investment building, 165 Broadway, New York City, which will be his main office. He will make a specialty of the design and operation of the most modern plants, furnaces and machinery.

INTO CLOSER UNION

Were Pacific Coast Employers Brought by Series of Meetings.

Seattle, Wash., Dec. 23.

General H. G. Otis, owner and publisher of the Los Angeles Times; John Kirby Jr., of Dayton, O., president of the National Association of Manufacturers, and J. P. Bird, business manager of the National Association of Manufacturers, have just completed a tour of the Pacific northwest during which by many strong speeches at banquets and other gatherings they have brought the employers and manufacturers into closer union. Large bodies of business men met them at every place they visited and did them honor as hosts at three big banquets at Portland, Seattle and Tacoma.

All their addresses had much to do with the promulgation of the open shop principle. None of the speakers denied the right of laborers to organize, but they decried a condition which would permit of 15 per cent of the laboring men in the country, who are organized, dominating the 85 per cent who are unorganized. General Otis disputed the wisdom of labor unions, declared that non-union labor has all the rights under the law and the constitution that is possessed by organized labor, and said that the non-union man should be afforded full protection by the government under which he lives. Mr. Kirby explained that he is not opposed to organized labor as such in every instance, but is hostile to those unions which deny the right of their unorganized brother to earn a living and which use methods not in accord with the principles of equity and justice in enforcing their demands.

The employers who entertained the prominent guests were well pleased with the meetings as they also resulted in the individuals being brought closer in harmony with each other. Many of the industrial and commercial problems of this part of the country were given full and free discussion around the banquet board.

Aviation School.—The Hempstead Plains Aviation Co., capitalized at $50,000, has been chartered in New York state by Alfred Moisant, John B. Moisant, Allen Evarts, Charles Stewart Butler and Gage E. Tarbell. The company has secured a lease upon a large tract of land east of Garden City, N. Y., and will maintain a school of aviation. There is in contemplation the erection of a plant for the manufacture of flying machines and other accessories with machine shops and laboratories for the use of pupils and experimenters. It will be known as the Moisant School of Aviation.

PLANS TO TAKE OVER MOTOR CONCERNS.

The Consolidated Motor Car Co., a holding concern incorporated Aug. 5, 1910, under the laws of Ohio, has made tentative arrangements for taking over the Royal Tourist Car Co., Cleveland, the Pennsylvania Auto Motor Co., Bryn Mawr, Pa., and the Empire Motor Car Co., Indianapolis. This concern plans also to take over several other smaller companies in the near future. The Consolidated Motor Car Co. is capitalized at $4,000,000, which is equally divided between common and preferred stock. The officers are: President, E. D. Shurmer; vice president, K. F. Gill; treasurer, A. H. Bedell; secretary, W. D. Forsyth. Besides the officers, O. M. Stafford, F. C. Caine and F. W. Scott are members of the board of directors.

GOVERNMENT CHAIN CONTRACT.

The Standard Chain Co., Pittsburg, has been awarded a contract by the government for 96,400 feet of its "Ajax" steel loading chain to be used in anchoring torpedo mines. The award was made at the close of spirited competition.

RAILWAY EQUIPMENT ORDERS.

Estimates made by the *Journal of Commerce* of the railway equipment orders of the present year show 2,806 locomotives, 114,174 cars, 1,388,525 tons of rails and 398,300 tons of bridges placed by the different roads. The rail estimate includes 150,000 tons for the Pennsylvania system, which is still in abeyance.

The Westinghouse Machine Co. has received an order from the Suburban Gas & Electric Co., Pottstown, Pa., for one 625-kilowatt high pressure turbine, and the Westinghouse Electric & Mfg. Co. will furnish a 2,300-volt, three-phase, 60-cycle, alternating current generator to go with the turbine.

The H. C. Frick Coke Co. has donated 537 acres of land at Mt. Braddock, near Uniontown, Pa., to Fayette county, on which a poorhouse, children's home, insane asylum and other county buildings will be erected.

COKE FREIGHT RATE

Dispute Decided by Interstate Commerce Commission.

Washington, Dec. 27.

Holding that smelters of iron and copper do not compete with each other in any proper or ordinary sense of the term in that iron sells ordinarily for $18 to $20 a ton, while copper is rated at between $200 and $500 and that the rate of $2.65 per ton for hauling coke other than that used in blast furnaces for smelting iron from ore from the West Virginia-Pennsylvania ovens to Chicago is not unjust or unreasonable, the interstate commerce commission has announced that the complaint of the Anaconda Copper Mining Co. against the Chicago & Erie railroad is dismissed.

In disposing of the allegations that the Chicago & Erie discriminates against copper smelters in favor of smelters of iron by charging $2.35 per ton on coke hauled over the same route for use in the blast furnaces of the Chicago iron smelters, the commission points out that it has always disapproved of the practice of basing freight charges upon the use to which the commodity is to be put; but that in this case such discrimination is allowable because the reduction in rate was made for the purpose of enabling the Chicago iron smelters to compete with the southern blast furnaces, which have their coke ovens close at hand.

The claim of the Anaconda company for reparation for alleged overcharge during the last five years could not be considered by the commission, for section 16 of the act to regulate commerce, bars action on matters which antedate the complaint by more than two years.

ROLLING MILL SOLD.

The Wheatland, Pa., rolling mill and ground of the Shenango Iron & Steel Co. were sold Dec. 21 to J. H. Findlay, of Pittsburg, for $22,500. This property has been in the hands of Receiver C. C. Murray for several years.

The Westinghouse Electric & Mfg. Co. has declared the usual quarterly dividend of 1¾ per cent on preferred stock. In addition the company has declared on account of accumulated back dividends a payment of 3½ per cent on the issue. They are payable Jan. 16.

C. C. McGann, Catlettsburg, Ky., is in the market for electrical equipment to be used in an automobile garage.

CONCILIATION BOARD

In San Francisco Controversy—Vote of Thanks Extended.

On Dec. 8, THE IRON TRADE REVIEW presented the recent developments and the present conditions obtaining in the iron and steel industries in San Francisco, under the head, "San Francisco Employers Working Together." The destruction of the city in 1906 by earthquake and fire and the way that San Francisco has been rebuilt in the last four years was cited as showing the almost boundless resources of the country. Mention was made of the first agreement signed in 1907 as a result of the conditions brought about by the city's destruction, and the resulting gradual shortening of hours until the eight-hour day was adopted in June, 1910. The action of the Commonwealth Club in bringing about the organization of the San Francisco Conciliation Board, its subsequent development and the agreement submitted by the sub-committee of the board, to the Metal Trades Association and the Iron Trades Council, for ratification, were explained.

Since the publication of this article, there has been much discussion of the eight-hour day and the attitude of the labor leaders in San Francisco. The findings of the sub-committee have as yet not been adopted by either the California Metal Trades Association or the Iron Trades Council of San Francisco. The Iron Trades Council of San Francisco represents organized labor and maintains that all lines of labor shall in the future as in the present, continue on the eight-hour work-day basis. The California Metal Trades Association is an organization of employers of the iron and steel industries of San Francisco. It has been brought together to obtain for its members, rights and conditions such that they may live and compete for business with other manufacturers on the coast and throughout the country. The findings of the sub-committee are signed by C. M. Elliott, Harris Weinstock and Joseph Martin for the employers and by Andrew J. Gallagher, Michael Casey and Walter Macarther for the employes.

A vote of thanks has been extended to THE IRON TRADE REVIEW by the California Metal Trades Association for its fair treatment of the situation. By request, and in view of the importance of the findings of the board and future developments therefrom, not only on the Pacific coast but throughout the country, they are herewith presented in full:

The sub-committee of the San Francisco Industrial Conciliation Board, composed of three employers and three wage earners, to which has been referred for conciliation the existing controversy between the Metal Trades Association and the Iron Trades Council has carefully considered the points of existing differences between the organizations, which are as follows:

California Metal Trades Association wants:

a. A three-year contract.
b. Working hours to be equalized on Jan. 1, 1911, based on the hours in force in the iron trades among men working within the states of Washington, Oregon and California.
c. Wages to be equalized on Jan. 1, 1911, based on the hours in force in the iron trades among men working within the states of Washington, Oregon and California.

Iron Trades Council wants:

a. A one-year contract.
b. Wages and conditions to remain as now during the life of the contract.
c. Hours to remain as now during the life of the contract.

After the fullest hearing of the representatives of both sides, and in view of all the conditions involved in the controversy, the Board of Conciliation submits the following proposed agreement as its findings and as a fair and equitable settlement of the points at issue:

Draft of Agreement.

Agreement, made this ninth day of November, 1910, between the California Metal Trades Association and the Iron Trades Council of San Francisco.

First: The terms of this agreement shall run from Nov. 9, 1910, until Nov. 9, 1913.

Second: The wages provided for in the former agreement shall be in force for the full term of this agreement.

Third: When disputes of any kind arise between any of the affiliated unions of the Iron Trades Council and a member of the California Metal Trades Association, an accredited representative of each organization shall proceed to the shop where dispute exists and endeavor mutually to settle the same, and any dispute which cannot be settled in this manner must be referred to conference and should this conference of itself be unable to settle any questions which may come before it, it shall provide some method of adjusting the same, and, pending a decision, there shall be no lockout on the part of employers, nor strike on the part of the employes.

Fourth: Eight hours shall constitute a day's work until Nov. 9, 1911. On Sept. 9, 1911, a conference shall be called to decide, as provided in section three of this agreement, what hours shall be in effect from Nov. 9, 1911, until Nov. 9, 1913. This conference shall be called for the purpose of equalizing hours in force at that time among men working within the states of Washington, Oregon and California, and their decision shall become operative on Nov. 9, 1911, and shall be in effect until Nov. 9, 1913.

The Conciliationn Board recommends an agreement to continue to Nov. 9, 1913, instead of to June, 1911, as asked for by the Iron Trades Council.

First. Because the last agreement was for three-year period and proved mutually advantageous and satisfactory.

Second: Because it is to the interest of employer and employed that there shall be as much certainty and steadiness to the trade as possible.

It has taken nearly six months from the time that negotiations for a renewal of agreement were begun, before the present state of proceedings was reached.

If a one-year agreement was to be entered into, there would be no guarantee that this experience would not be repeated, so that for at least half the time the whole iron trades industry in the vicinity would be kept in a state of unrest and uncertainty to the injury of both parties, to say nothing of the mutual loss of valuable time consumed in conducting negotiations, which time might better be spent by the employer in finding work to keep his men employed and by the worker in earning wages.

The sub-committee of the San Francisco Industrial Conciliation Board desires at this time to put itself on record as being in favor of the eight-hour day, and calls upon the employers in the California Metal Trades Association to co-operate with the Iron Trades Council, of this city, to bring about the eight-hour day as speedily as possible as a permanent condition.

The board recommends that eight hours shall continue to constitute a day's work until Nov. 9, 1911, instead of to Jan. 1, 1911, as asked for by the California Metal Trades Association, for the reason that in the judgment of the board the eight-hour day in the San Francisco iron trade, having been in force only since June 1, 1910, a period of but five months, has not had a sufficiently long trial.

It is believed that by Nov. 9, 1911, when the eight-hour day will have been in operation for a year and five months, it will be possible to reach a more satisfactory conclusion as to its justification than can be reached at this time. There are many who express the opinion that by Nov. 9, 1911, the eight-hour day will have become the common condition in the Pacific coast iron trades. If so, there will then at that time be no further issue in San Francisco on the question of hours. Should it not have become a common condition, it will be dealt with as provided for in section four of the proposed agreement.

The board further recommends that the present wage rate be continued during the life of the proposed agreement, because it finds it to be a reasonable wage rate and one which, in view of the steadily increasing cost of living here as elsewhere, ought not be cut down.

Despite the fact that three members of the sub-committee of the Conciliation Board having this controversy in hand are employers representing employers and that three members are wage earners representing employes, all the members of the sub-committee in conducting the present inquiry and in reaching the foregoing conclusions, have earnestly striven to set aside all feelings of partisanship. The aim of the board had been to find the equities in the case regardless of upon which side such equities might be found. It is due to this mutual spirit of fairness that it has been possible for the Conciliation Board, composed as it is of an equal number of employers and wage earners, to reach a unanimous conclusion which it believes is fair and just to both parties and in the public interest.

The Conciliation Board was much gratified to note the spirit of mutual courtesy and respect shown by the committee of iron workers representing the Iron Trades Council, and the committee of employers representing the California Metal Trades Association, toward each other during the prolonged controversy, spread as it was over many months and including many meetings. The board was also pleased to observe that a feeling of reasonableness and mutual good will prevail on both sides at the conference held before the Conciliation board, all of which speaks well for both worker and employers.

The hope is expressed that the Iron Trades council and the California Metal Trades Association will see their way clear to accept the findings herewith submitted, with the same good will and to carry out their provisions of the three year agreement entered into in June, 1907.

This is the first case that has been brought before the newly-created San Francisco In-

dustrial Conciliation board and, perhaps, one of the most important cases that is ever likely to be brought before it, representing as it does one of the great local industries giving employment to many thousands of men and representing the investment of many millions of capital.

The unanimous conclusion reached by the board and its cheerful and ready acceptance by both sides to the controversy will tend to bring about a new era in our industrial world. It will tend to pave the way for peaceful and honorable settlements of future labor disputes, not only here but elsewhere throughout the land, without recourse to industrial war with its usual disastrous and costly consequences, thus adding much to the future peace and prosperity of the worker, the employer and the community.

DECREASED IMPORTATION OF MATERIALS.

Washington, Dec. 26.

A marked falling-off in the importation of manufacturers' materials is indicated by the November import record, just completed by the bureau of statistics. This is especially true of copper, pig iron, fibers, rubber and lumber. Of unmanufactured fibers the November imports were 23,147 tons, valued at little more than $2,000,000, against 38,203 tons, valued at $3,500,000 in November of the preceding year. Of lumber (boards, deals and planks) the November, 1910, imports aggregated 103,981 thousand feet, with a total value of $2,000,000, as compared with 119,579 thousand feet, valued at nearly $2,250,000, brought in during the same month, 1909. The November, 1910, imports of India rubber aggregated 6,250,000 pounds, valued at $5,750,000, against 8,800,000 pounds, valued at $8,750,000, imported during November of last year. Imports of pig iron in November, 1910, were but 20,000 tons, valued at about $500,000, against 35,000 tons, valued at nearly $750,000, which were imported during November of the preceding year.

Articles other than manufacturers' material in most cases show but little change, some representing a slight reduction and others a slight increase when compared with the imports of November, 1909.

Acquires New Property.—The Elyria Iron & Steel Co., Elyria, O., has purchased the old Elyria city waterworks property and other adjacent property, in all some 30 acres, which is adjacent to and an addition to its present site on Mussey avenue, Elyria. The property purchased, being all waterfront, is one of the best factory sites now unoccupied near Elyria, and the Elyria Iron & Steel Co. will eventually extend its plant to the new site, although no plans for extensions are being considered at the present time.

GETTING A SLOGAN.

How One Company Pushes Home the Value of Its Product to the Trade.

The Stark Rolling Mill Co., Canton, O., on Dec. 22, awarded prizes that terminated a contest full of interest to everyone connected with the advertising and selling end of iron and steed products. On Dec. 1, the Stark concern sent out some 700 circular letters to all their jobbers, dealers and salesmen handling Toncan metal. The letter stated briefly the value of Toncan metal and the fact that after three weeks four prizes would be awarded for the four best slogans received, setting forth the value and use of Toncan metal. Four hundred and seven replies were received, bringing in one or more slogans each, from which the judges selected the following four prize winners: First, "Toncan Metal—Then a Long Wait," by A. D. Grant, Hyndman Roofing Co., Cincinnati; second, "Toncan Metal—There With the Wear", by Sim Watkins, Seymour, Ind.; third, "Toncan Metal—It Stays and Pays", by E. H. Shaw, The Berger Mfg. Co., San Francisco; fourth, "Toncan Metal—Long Life and a Short Price", by C. E. Saylor, Barker, Rose, Clinton Co., Elmira, N. J. C. A. Weirich, Kanneberg Roofing Co., Canton, O.; F. A. Schwertner, Berger Mfg. Co., Canton, O., and L. P. Zimmerman, THE IRON TRADE REVIEW, Cleveland, were the judges. All those sending in slogans, who did not receive prizes, were presented with watch fobs of Toncan metal by the Stark Rolling Mill Co.

EIGHT-HOUR DAY LEADS TO FEW BIDDERS.

Bids opened at the bureau of yards and docks, navy department, Washington, for steel caissons to be built into the drydocks now under construction for the New York navy yard, Premerton navy yard and the naval station at Pearl Harbor, Hawaii, were as follows: Snare & Triest Co., New York, item 5, $122,980; Union Iron Works, San Francisco, item 2, $276,370; item 3, $134,675; item 4, $141,695; James Shewan & Sons, New York, item 5, $132,000; John N. Robnes Co., New York, item 5, $142,300; Willamette Iron & Steel Works, Portland, Ore., item 3, $110,000, and item 4, $125,000.

A larger number of bids on this work was expected, but many letters implying a reluctance to bid until some definite interpretation of the eight-hour law was given out, were received by the navy department up to the day of the opening of the five tenders received. These results show more clearly than anything else which has happened the depressing effect upon the country's producers of the recent revival of the eight-hour law of 1892. While the attorney general has emphatically stated that he believes the restriction applies only to the actual construction of the structure itself and not to the manufacture of its integral parts, the general tone of his opinion is so ambiguous that, although the specifications of these caissons expressly provided that they may be built anywhere and shipped to the point where they would be put into one of the drydocks by the government, but five firms have placed sufficient confidence in the government to risk a bid.

SALE PRICE OF STOCK TO EMPLOYES.

The price of $114 a share at which preferred stock is being offered to employes by the United States Steel Corporation for 1911 subscriptions, is second to the highest figure stipulated since this plan has been in vogue. The subscription prices of the other years have been as follows: 1903, $82.50; 1904, $55; 1905, $87.50; 1906, $100; 1907, $102; 1908, $87.50; 1909, $110; 1910, $124. The common stock has only once before been offered for subscription, for 1909, at $50 a share. The price at which it is offered for 1911 is $70 a share.

WELSH TIN PLATE TRADE.

Swansea harbor trust returns of tin plate for the week ending Dec. 10, with comparisons, follow:

	Week of Dec. 10. Boxes.	Previous week. Boxes.	Corresponding week last year. Boxes.
Received	100,523	100,657	104,137
Shipped	92,924	80,276	77,993
Stocks	193,146	185,547	114,334

RE-ELECTED PRESIDENT.

Directors of the Alabama Consolidated Coal & Iron Co., at their recent annual meeting, re-elected Joseph H. Hoadley president of the company.

The American Rolling Mill Co., Middletown, O., has declared a dividend of 1½ per cent on preferred stock and 3 per cent on common, payable Jan. 15.

Manning, Maxwell & Moore have declared the regular quarterly dividend of 1½ per cent.

TWO FREIGHT BOATS

Taken by Newport News Company—Inquiry for Cars.

New York, Dec. 28. (By wire.)

The Newport News Ship Building & Dry Dock Co. has taken contracts for two additional freight boats which will require 1,500 tons each. Rail orders include 1,000 from the Kansas City & Southern and 1,000 from the Louisiana Navigation & Railroad Co., to the Tennessee Coal, Iron & Railroad Co., 2,000 scattering to the Illinois Steel Co.

The Pennsylvania lines west are in the market for 800 to 900 freight cars.

A pig iron inquiry from the Pennsylvania railroad for its Altoona plant calls for 900 to 1,800 tons of forge and No. 2X grades of pig iron.

CONTRACT FOR FURNACE COKE.

Pittsburg, Dec. 28. (By wire.)

A merchant furnace interest with general offices in Cleveland has closed for its full requirements of furnace coke over the first half, aggregating between 180,000 and 200,000 tons. About 30,000 tons of this amount were bought at $1.40, ovens, for shipment in January, and the remainder was purchased at about $1.60, ovens, for delivery over the five months beginning Feb. 1.

CONTRACT FOR SPLICE BARS.

Pittsburg, Dec. 28. (By wire.)

The Louisville & Nashville Railroad Co. has awarded a contract to the Carnegie Steel Co. for 1,200 tons of splice bars.

During the past few days several inquiries for billets and sheet bars for first quarter delivery have appeared in this market. Several sales of billets and sheet bars in 500-ton lots are reported for immediate shipment.

Personal

Cecil H. Taylor, formerly chief engineer of the Hudson Motor Car Co., has accepted a position with the E-M-F Co., in its engineering department.

H. Pell, who resigned from the board of the International Nickel Co. some weeks ago, was re-elected at the last meeting of the directors of the company.

R. A. Heesen, of Heesen Bros. & Co., founders, Tecumseh, Mich., is slowly recovering from injuries received in an automobile accident about one month ago.

A. A. Fowler, resident manager of Rogers, Brown & Co., at New York, is again at his office after a month's absence because of illness. Mr. Fowler has just returned from a sojourn at North Carolina points.

Walter Loring Webb and James M. Kennedy, both known in the engineering world, the former as an engineering text book writer, have joined the organization of Dodge, Day & Zimmerman, of Philadelphia.

P. J. Moran, who has been superintendent of the West Middlesex, Pa., and Leetonia, O., stacks of the M. A. Hanna interests, has been appointed to a like position at the Toledo, O., furnaces of Pickands, Mather & Co.

Harry Linton, who has been superintendent of the Central Foundry & Machine Co., has accepted the appointment of general manager of the Kewanee Foundry & Mfg. Co., which is building a new plant at Kewanee, Ill. He will assume his new position Jan. 1.

The Carnegie Steel Co. announces that, in view of the retirement of Samuel A. Benner, general manager of sales, from the service of the company on Dec. 31, it has been decided that H. P. Bope, first vice president, shall on Jan. 1, 1911, also assume the title and duties of general manager of sales.

Obituary

David H. Valentine, a prominent business man of Brooklyn, died there Dec. 21. He was a director of the American Stoker Co. and other corporations.

William Resor, founder of the William Resor Stove & Foundry Co., and one of Cincinnati's oldest business men, died in that city, Dec. 23, aged 73. He had been in failing health for six months. About ten years ago he retired from active business connection with the stove company.

Thomas G. Williams, secretary and general superintendent of the Standard Steel Co., Bedford, O., died in Bedford, Dec. 16. Mr. Williams was well known in the sheet steel and tin plate industries, and had been connected with a number of firms in Ohio, West Virginia and Pennsylvania. His age was 62.

Edward J. Gardner, president of the Gardner Axle Works, Carlisle, Pa., died Dec. 25, at Carlisle, after a week's illness of pneumonia, aged 60. He was also engaged in the manufacture of cars at Huntington, Pa. He was the son of Frank Gardner, a pioneer in steam engine and car manufacturing in Pennsylvania.

Charles E. Pollard, designing and selling engineer of E. W. Bliss Co., Brooklyn, died of apoplexy, Dec. 16, aged 53. He entered the employ of the Stiles & Parker Press Co., of Middletown, Conn., and when this concern was absorbed by the E. W. Bliss Co., 18 years ago, he went to the Bliss company, with which he remained until his death.

William Coutie, one of the best known scientific men in the country, died at Troy, N. Y., Dec. 26, aged 92. He was born in Scotland in 1819, and had been a resident of this country for 62 years. Many of his papers on scientific subjects have been read at the Smithsonian Institute. He was a member of the American Chemical Society and is believed to have been the first man to compound engines for factory purposes.

ENLARGING ITS BUSINESS.

The Detroit Steel Products Co., Detroit, advises respecting the incorporation of its company in Illinois that the Detroit company has merely taken out a license to do business in Illinois, continuing its office at 171 Washington street, Chicago, with Charles R. Ayers as manager. This office is conducted for the sale of its solid steel Detroit Fenestra windows. The company is also maintaining its own office in New York City, at 2 Rector street, Raymond R. Kinnear, manager; at St. Louis, 712 Odd Fellows buildingy, Carl R. Bradt, manager. It has sales agencies in the principal cities.

TO OVERHAUL PLANT.

Louisville, Ky., Dec. 26.

It is understood that the local plant of the United States Cast Iron Pipe & Foundry Co. is to be closed down temporarily. A general overhauling and repair of the plant will be arranged.

MOTORS FOR PANAMA CANAL.

New York, Dec. 28. (By wire.)

Bids will be taken, Feb. 25, for 116 motors and limit switches for operating gate valves and 120 motors and limit switches for operating cylindrical valves at the Panama canal.

FOUNDRY PIG BOUGHT.

Pittsburg, Dec. 28. (By wire.)

A manufacturing interest in the Pittsburg territory has closed for 4,000 tons of foundry pig iron for delivery over the first quarter. Little information as to the price paid is available.

The works of the Eclipse Brass & Aluminum Foundry Co., Bradford, Pa., were badly damaged by fire, Dec. 16. Valuable patterns were destroyed by the flames. The loss is estimated at $1,000.

IRON AND STEEL SECURITIES

The features of the New York stock market last week were the stagnation in stocks and the relative activity in bonds, which were firm and higher. Easy money market conditions are expected early in the year, when the flow of money from the interior will probably witness a large accumulation of funds in New York.

Monday the market was strong and active, with prices firm and higher. Extreme dullness characterized Tuesday's market, and prices averaged slightly lower. The general market on Wednesday was extremely dull, but the close found prices slightly lower. On Thursday, only 213,000 shares changed hands on the New York market, prices being slightly lower at the close; the foreign securities markets were also extremely quiet. Sales Friday reached only 112,000 shares, the close being heavy and lower. On Saturday, the stock exchanges were closed, but the grain market opened and ruled firm with a sharp advance in corn.

Continued dullness ruled in the call money market, the rates ranging from 3½ to 2½ per cent. In time money, there was little demand, and the consequence was a fall in rates accompanied by a comparatively liberal supply. The weekly statement of the New York banks showed a gain of nearly $9,500,000 in deposits, and an increase of $2,918,100 in cash reserves. The actual statement of clearing house banks showed loans increased $6,248,800; deposits increased $9,447,300; surplus increased $523,375, and the percentage of reserve 25.86, compared with 25.83 the week previous. Non-member banks and trust companies showed loans increased $424,100; net deposits decreased $488,300, and the percentage of reserve 17.1, compared with 17.2 the week previous. Bank clearings fell below the average of recent weeks, and while there was an increase over a year ago, this is due to the fact that Christmas last year came at the close of the week. Commercial failures for the week were 271, compared with 290 the preceding week, and 264 the corresponding week last year. Shares were sold to the number of 1,418,180, compared with 1,763,600 the preceding week, and 2,904,600 the corresponding week last year. Bonds exclusive of government bonds were sold to the amount of $12,178,000, compared with $12 829,000 the preceding week, and $15,910,000 the corresponding week last year.

	Closing Quo. Dec. 23	Changes in week	Annual Meeting Date 1910		Stock Outstanding	Basis	Dividend Last Dividend	Dividend Date Last Div. Pay.
Allis-Chalmers	8⅜	+ ⅛			$19,820,000		.....	.....
Allis-Chalmers, pr	30	+2½			16,150,000	7 cum.	1¾ Q.	Feb., 1904
American Can	8⅞	— ½	Feb.	2	41,233,300		1¾ Q.	.....
American Can, pr	76⅜	+1¼			41,233,300	7 cum.	1¾ Q.	Jan., 1911
Am. Car & Fdy	49¾	— ⅛	June	24	30,000,000		½ Q.	Jan., 1911
Am. Car & Fdy., pr	115⅛	.....			30,000,000	7 n. c.	1¾ Q.	Jan., 1911
American Loc	36½	.....	Oct.	18	25,000,000	5	1¼ Q.	Aug., 1908
American Loc., pr	105½	— ½			25,000,000	7 cum.	1¾ Q.	Jan., 1911
American Ship	75	.....	Oct.	12	7,600,000	4	1 Q.	Sept., 1910
American Ship, pr	111	.....			7,900,000	7 cum.	1¾ Q.	Jan., 1911
Am. Steel Foundries(new)	42½	.....	Dec.	1	17,184,000		1¼ Q.	Nov., 1910
Barney & Smith	20	.....	June	7	2,000,000	4	1 Q.	Dec., 1910
Barney & Smith, pr	85	.....			2,500,000	8 cum.	2 Q.	June, 1908
Bethlehem Steel	29¼	+ ¼	April	5	14,862,000		.....	.....
Bethlehem Steel, pr	59	— ¼			14,908,000	7 n. c.	¾ Q.	Feb., 1907
Cambria Steel	42½	.....	Mar.	15	45,000,000	5	1½ Q.	Nov., 1910
Cambria Iron	45	.....			8.468,000*	4	2 S. A.	Oct., 1910
Chicago Pneumatic Tool	41	— ⅛	Feb.	21	6,485,800	4	1 Q.	Oct., 1910
Colorado Fuel	31	— ¼	Oct.	17	34,235,500		1¼ Q.	Apr., 1902
Crucible Steel	127⅛	+ ¼	Oct.	19	24,578,400		3½.	.....
Crucible Steel, pr	76	.....			24,436,500	7 cum.	1¾ Q.	Dec., 1910
Empire Steel	5	.....	Feb.	23	1,254,770		.....	.....
Empire Steel, pr	50	.....			2,500,000	6 cum.	2 S. A.	Jan., 1911
Fay & Egan	70	.....	Feb.	15	1,000,000	6	3 S. A.	Feb., 1909
Fay & Egan, pr	110	.....			1,000,000	7 cum.	1¾ Q.	Nov., 1910
General Electric	154¾	— ⅛	May	10	65,179,600	8	2 Q.	Jan., 1911
Harbison-Walker	32¼	.....	Jan.	17	18,000,000		½ Q.	Dec., 1910
Harbison-Walker, pr	94½	.....			9,600,000	6 cum.	1½.	Oct., 1910
International Pump	40¼	— ¼	May	10	17,762,500		1 Q.	Nov., 1910
International Pump, pr	84½	— ½			11,350,000	6 cum.	1½ Q.	Nov., 1910
Lackawanna Steel	35	.....	Mar.	9	34,978,000		.....	.....
Lake Sup. Corp	28¾	+1⅛	Oct.	5	40,000,000		.....	.....
New York Air Brake	71	+ ½	June	16	10,000,000	8	1½ Q.	Jan., 1911
Niles-Bement-Pond	98	.....	Feb.	2	8,500,000	6	1½ Q.	Dec., 1910
Niles-Bement-Pond, pr	104	.....			2,000,000	6 cum.	1½ Q.	Nov., 1910
Otis Elevator Co	48	—1	Mar.	21	6,375,000	3	1½ S. A.	Oct., 1910
Otis Elevator Co., pr	95	.....			6,310,000	6 n. c.	1½ Q.	Jan., 1911
Pa. Steel	60	.....	May	9	10,750,000		.....	.....
Pa. Steel, pr	104	.....			16,500,000	7 n. c.	3½ S. A.	Nov., 1910
Pittsburg Coal Co	18¼	.....	Mar.	8	28,104,600		.....	.....
Pittsburg Coal Co., pr	66½	.....			27,071,800	7 cum.	1¾ Q.	Oct., 1910
Pressed Steel Car	30	— ⅛	Feb.	16	12,500,000		1 Q.	Aug., 1904
Pressed Steel Car, pr	93½	— ½			12,500,000	7 n. c.	1¾ Q.	Nov., 1910
Pullman	158½	—1⅜	Nov.	9	120,000,000	8	2 Q.	Nov., 1910
Railway Stl. Spring	31¼	— ¼	Mar.	3	13,500,000	2	1 S. A.	Oct., 1908
Railway Stl. Spring, pr	92	— ⅛			13,500,000	7 cum.	1¾ Q.	Dec., 1910
Rep. Iron & Steel	30½	— ⅛	Oct.	19	27,191,000		.....	.....
Rep. Iron & Steel, pr	93½	+1			25,000,000	7 cum.	1¾ Q.	Jan., 1911
Sloss-Sheffield	49½	.....	Mar.	9	10,000,000	5	1¼ Q.	Sept., 1910
Sloss-Sheffield, pr	114½	.....			6,700,000	7 n. c.	1¾ Q.	Jan., 1911
U. S. Pipe & Fdy. Co	16¼	+ ¼	June	22	12,106,300	2	1 Q.	Dec., 1910
U. S. Pipe & Fdy. Co., pr	52	— ⅛			12,106,300	7 n. c.	1½ O.	Dec., 1910
U. S. Steel	72⅛	— ⅛	April	18	508,302,500	5	1¼ Q.	Dec., 1910
U. S. Steel, pr	116⅞	+ ⅜			360,281,100	7 cum.	1¾ Q.	Nov., 1910
U. S. Steel 5s	104⅛	+ ⅛			463,798,000	5	.....	.....
Va. Iron, Coal & Coke	56½	+6½	Sept.	20	9,073,680		5. †	Oct., 1907
Westinghouse Electric	66½	.....	July	27	3,998,700*		5¼ Q. **	Jan., 1911
Westinghouse Air Brake	140	+1	Oct.	4	13,750,000*		5 Q. ‡	Jan., 1911

Par value of shares, $100, except those starred (*), $50.
**Includes 3½ per cent on back dividends.
†Stock.
‡Includes 1¼ extra and 1 special.

Copper Stocks.

New York.—Amalgamated Copper closed 62⅝, a net loss of 1¼.

Boston.—Butte Coalition closed 18⅞, a net loss of ⅞; Calumet & Arizona closed 49¾, a net gain of ¾; Calumet & Hecla closed 560, a net gain of 5; North Butte Mining closed 29, a net loss of ½; Quincy Mining closed 71, a net loss of ½.

Financial Notes.

The Chicago Railway Equipment Co. has declared the regular quarterly dividend of 1¾ per cent, payable Dec. 31.

The Pittsburg Valve Foundry & Construction Co. has declared an extra dividend of 1 per cent, making 8 per cent for the year.

THE IRON TRADE REVIEW

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January, 1910	5,681
February	5,703
March	5,754
April	5,793
May	5,827
June	5,842
July	5,864
August	5,875
September	5,895
October	5,955
November	5,993

December 29, 1910

RAILROAD AND CANAL PERFORMANCE

Statistics which have been carefully kept for a number of years of railroad car performance show that the freight car movement the country over has averaged between 22 and 23 miles per day, the proportion of loaded movement being about 70 per cent. We understand that the collection of these statistics was undertaken by the American Railway Association in large part for the purpose of encouraging the better movement of cars and also for the purpose of measuring accurately such improvement as might be effected.

Shippers cannot "get over" the fact that the average movement of freight cars, loaded, is only 15 or 16 miles a day. Strictly speaking, of course, the movement may perhaps be greater than this, for it is physically impossible to gather statistics of two million freight cars and state the precise time when each car changes from a loaded car to an empty, and vice versa. What is done is to ascertain the total number of miles moved and ascertain the percentage of miles moved when the car is loaded. At 23 miles per car per day and 70 per cent, making an equivalent of 16 miles loaded, the time the car is stationary is apportioned between loaded and empty simply in accordance with the showing made by the mileage moved, loaded and empty.

When this particular study was undertaken, we understand it was expected that very substantial improvement in car movement would be shown with a reasonable time, say within a year or two. This can hardly be said to have occurred. The last report made is for August, 1910, and compares with the corresponding month in the two preceding years as follows:

1910.....	23.2	70.3
1909.....	23.2	70.1

The variations are attributed chiefly to variations in the volume of business offered, there having been a large surplus of cars in August, 1908, with a small surplus in the month in each of the two succeeding years.

The proposition to move the cars more rapidly is very attractive to both railroads and shippers. The latter suffer inconvenience from slow delivery of freight and on the average there is also a large actual expense. Larger stocks must be carried, or delays are experienced in completing given operations through waiting on a portion of the material. In the case of high priced material, there is an important loss in interest charge. We are not familiar with any statistics showing the average or total value of merchandise transported on railroads, but since railroad cars are worth on an average a thousand dollars, perhaps considerably less, in view of the large number of old wooden cars, it is obvious that except in the case of the cruder commodities the load is worth much more than the car, and the expense of delay falls more heavily upon the shipper than upon the railroad.

To the railroad the quicker movement of cars is naturally very attractive, for an increase of only one mile per day in car movement would be equivalent to adding about 100,000 cars to the 2,000,000 or more now in service, not only avoiding the expenditure for cars, but saving in investment in locomotives, main line and terminal facilities, for cars take up room, and when delayed it is usually at the worst place.

It would not be amiss for those who are urging the building of various canals to study the difficulties of the railroads. Many well meaning attempts are made at arguing in favor of various canal projects, when it seems pretty clear that those who speak for the project would be given pause if they reflected upon the fact that with all the facilities and conveniences the railroads have they cannot do better than an average of about 23 miles per car per day. A railroad car is certainly a very convenient means for moving freight, for it can at slight expense be moved into and out of a manufacturing plant, making direct connection with the very point where the material is produced or consumed. In yards it can be examined with facility. A canal boat looks almost impossible beside it. Ninety-nine per cent of the energy expended upon canal projects is in the direction of playing politics and creating "public sentiment." Presumably these are necessary, but a little reflection upon the difficulties of the railroads in handling the vastly more serviceable and convenient railroad car should move the canal boomers to prepare a somewhat better case for the canal boat. The railroads have found that the junction and terminal points cause the rub, and,

whatever may be possible, it has not been shown that the canal boat offers superior promise. In actual motion, it is, of course, admittedly inferior.

TRADE SCHOOLS VS. SCHOOL TRADES.

In its essential features the continuation trade school of Germany, which formed the subject of Dr. Kerschensteiner's address to the American Society of Mechanical Engineers and is printed in abstract elsewhere, closely resembles what has come to be referred to in the United States as the "Cincinnati system," worked out by the University of Cincinnati in conjunction with the employers of that city. That the courses or subjects dealt with in Cincinnati have reference chiefly to the metal working trades is merely a natural consequence of the prominence of the district in machine tool building and allied lines and has nothing to do with the case. It is really the first rational and well thought out and executed attempt at industrial education, and it would be a blessing to the nation if the futile and foolish efforts and expenditures of city school boards in "manual training" were either entirely abandoned or radically modified to methods similar to those inaugurated at Cincinnati.

Many educators are hopelessly impractical and far removed from a realization of the fact. All over the United States boys are being put through courses of manual training amounting to about 160 hours in the school year, the "course" extending over generally two years, and in this time they are given instruction in mechanical drawing, woodworking, forging and machine shop practice. The educators solemnly declare that the supply of skilled mechanics is falling off and the schools must make up the deficiency. Every employer knows what a real curse this intrusion of the schools has become. It is a grievous wrong to the pupil besides, because he leaves the school full of the idea that he has learned a trade, whereas on the contrary he has not even learned the rudiments of anything, and what little he has by chance absorbed must be unlearned as soon as practical work is begun. The boy is unwilling to begin a regular apprenticeship because he thinks he has already been over the ground, and so he either joins the ever-increasing swarm of botch workmen or abandons the field entirely, in which case his own time and the expense of his instruction are both wasted.

If the resources and efforts of the technical high schools were devoted to assisting the apprenticeship course instead of supplanting it, as recommended by Dr. Kerschensteiner, employers would be found enthusiastically willing to co-operate instead of looking upon the school methods as the extravagant fad of impractical educators, an opinion for which they have too much justification.

A youth is started in on mechanical drawing, for instance. Much stress is laid upon the exact size of his detail paper; border lines must be set up at exactly specified distances from the margin, only a particular grade of paper can be used and only certain rules must be followed in everything.

Hours are spent in elaborate geometrical constructions, while the proper arrangement of dimensions, the importance of clear, well formed figures and letters, the drawing of smooth, bold lines and more than all a clear understanding of sections, penetrations and relation of views, are utterly neglected. The very first requisite of a drawing, that it shall clearly and accurately convey instruction as to what is to be done, in the most concise manner possible, is subordinated to the making of pictures. Any one who has ever examined the "exhibits" of a class has seen these things. How long would such a youth with his school methods survive in a commercial drawing office?

So with the woodworking, forging and machine operations. The making of petty objects without knowing the reason why certain things should be done in a certain way or how or why methods may be modified is subordinated to the execution of a given task.

The whole system is petty and insufficient beyond description and as has been remarked, the spur of competition and the necessity of making good are entirely wanting. That such a system has not only obtained a foothold but is actually supported, passively if not actively, is a queer commentary upon twentieth century civilization.

MASSACHUSETTS PLANS NEW LIABILITY LAW.

The commission created by the state of Massachusetts at the last meeting of its legislature to investigate the subject of compensating workmen for injuries received in the course of their employment and to report to the next legislature a plan for adoption, has prepared a tentative draft of the bill. The proposed measure applies to employments wherein five persons or more are regularly engaged. Recovery is allowed in all cases, irrespective of negligence, except where injury is self-inflicted or due to intoxication or breach of statutory regulations. The employer is made liable for injuries to employes of a contractor or sub-contractor, but he shall have the right to indemnify himself from such contractor or sub-contractor. In case of the bankruptcy of the employer, the claim of the employe shall have priority under the acts of congress. Insurance companies shall be directly liable to the injured employe for the amounts due in this act. During the first two weeks of disability, no payments shall be made but the employer shall provide necessary medical treatment. In case of death, dependents wholly so, shall receive one-half the average wages of the employe for 300 weeks, but not less than $4 or more than $10 a week. If the employe is wholly incapacitated, he shall receive one-half wages for 300 weeks, of not less than $4 or more than $10 a week. If the employe is permanently partially incapacitated, he shall receive one-half wages for not more than 300 weeks but not less than $4 or more than $10 a week. Controversies under the act shall, in default of agreement between the parties, be setted by an arbitration committee of three, one of whom shall be chosen by each party and the third shall be a member of a state board, appointed by the governor, which shall be known as the Industrial Accident Board.

Tenders for Rails.—The commissioners of the Transcontinental railway will receive tenders, at Ottawa, Can., up to Jan. 24, for approximately 61,200 gross tons of 80-pound steel rails and the necessary rail fastenings.

The gray iron foundry of the Ross-Meehan Foundry Co., Chattanooga, Tenn., was seriously damaged by fire, Dec. 21. The fire originated in the roof around the cupola and caused damage estimated at $15,000, which is fully covered by insurance.

THE CONTINUATION SCHOOLS OF MUNICH[1]

Sketch of History of Trade Instruction and Reasons Which Forced it Upon Attention of Germany

By Dr. Georg Kerschensteiner.[2]

When I became director of education, it was evident to me that our educational institutions—and especially those that are concerned with the mass of the people—do support neither industry nor the state. In Germany every year, over half a million children leave our elementary schools at the age of fourteen, the very age at which character begins to form, and guidance is most necessary.

When the primary school was established at the beginning of the nineteenth century, seven or eight years of school attendance sufficed. At that time Germany was not a thickly populated country; custom held sway in trade and tradition in the family, both in rural districts and in the towns. Today Germany is an over-populated industrial community in which custom is disappearing and unfettered individualism seeks to overturn tradition. Almost one-half of the rising generation receives neither the discipline of a well-ordered family life nor a training in the duties that will rest on them as citizens. About 1870 the German states, finding that the elementary schools were insufficient to impart the necessary education, organized the public continuation school. At Munich two types of this school were founded in 1875, one for apprentices and the other for journeymen and foremen. The first was a general school of three grades, with from five to eight hours of instruction per week, compulsory for all boys in Munich between the ages of thirteen and sixteen. It was organized as an extension of the so-called general education of the elementary school. No regard whatever was paid to the pupil's trade. Instruction was given for five hours on Saturday and for three hours on one afternoon during the week, the subjects being reading, writing, arithmetic and drawing. At the continuation school for journeymen attendance was optional and the subjects of instruction were drawing, painting, modeling and chasing. Attention was paid almost exclusively to draftsmanship and the hobby of drawing was ridden to death. The school never thought of giving instruction in the management of a cost book, the preparation of specifications or in bookkeeping. It totally ignored the fact that, while the economic conditions of the present day require a technical and commercial training from the worker, the social conditions imperatively demand for him a civic training. Instead of realizing these requirements the school too often misdirected the pupil, making a moderate artist out of a good decorator and a second-rate furniture designer out of a good joiner.

Reorganization Necessary.

The barrenness of these schools became notorious. During the last decade of the past century the general continuation schools for boys were replaced by trade continuation schools modelled on those of Leipzig, Vienna and the grand duchy of Baden. This was a great step forward. Apprentices from the same trades could now be enrolled in the same classes and it was possible to adapt the curriculum to the actual needs of the pupil. Nevertheless the problem of the continuation school seemed to me to be still unsolved. The more I studied these schools during my journeys of inquiry in Germany, Switzerland and France, the more clearly did I see their incompleteness. The instruction was given, as a rule, in the evening when both pupils and teachers were worn out. Though the school endeavored to make the pupil's trade the focus of interest, the instruction yet lacked the breath of life. A few individual employers, and here and there an association of employers, took a languid interest in it. The bond of union between the school and the workshop was still wanting. The boy got, it is true, training in the requirements of his trade, but no one laid emphasis on the most important side, the practical work. Above all, it was forgotten that the boy was intended to become, not only a good worker, but also a good citizen, that the man was not to disappear in the laborer nor the future citizen in the apprentice. It was forgotten that modern states have placed power in the hands of the people, that the laziest and roughest day-laborer has an equal voice with the cultured statesman and the philosopher in the government of his country, and that therefore the most capable of our working classes ought to get a thorough insight into their duties as citizens; in a word, it was forgotten that "civics" is as necessary an element in the syllabus of our continuation schools as drawing and arithmetic. Therefore, I recommended not only to my city, but also to the Prussian Royal Academy a wholly new organization.

During the several times I have been in Scotland, England and the United States, I have seen that these nations keep the true import of this great task well in view. In that excellent book by Prof. Sadler, "Continuation Schools in England and Elsewhere," I find a quotation from circular 374 of the Scotch Education Department to this effect: "School work has for its aim and end objects more important than preparation, in the narrow sense, for any particular occupation. It should aim at producing the useful citizen imbued with the sense of responsibility and of obligation towards the society in which he lives; it should render him (so far as the school can do so) fit in body and alert in mind and should prepare him for the rational enjoyment of his leisure time as well as fit him for earning his living." In truth that is the aim of all school work and especially of the continuation schools. How, then, are the continuation schools to be organized, so that they may give a boy not merely instruction in his trade but also an education in citizenship?

The first step was to connect the craft school and practical instruction with all trade continuation schools. Thousands of boys have only a one-sided apprenticeship and thousands more lack even this. We must inspire them with the joy that springs from thoroughness of work; they must learn to appreciate the moral effect of good work on their own personalities. If we put the craft school and practical training, instead of text-books and mere words, in the forefront of instruction, we gain the good will of the pupils at once. This being so, there is no difficulty in leading them to appreciate allied branches of school work: drawing, arithmetic, bookkeeping, technology and the knowledge of materials, tools and machines. The interest aroused by practical work will be transmitted to all these allied subjects.

From considerations of this kind I

[1]Abstract of address at New York meeting of American Society of Mechanical Engineers, December, 1910.

[2]Director of education, Munich, Germany.

was strongly led to the opinion that a carefully devised scheme of manual instruction ought to form part of the curriculum in the highest classes of the elementary school, and that this should be done in the interest both of general education and of any particular trade that the pupil may join after leaving school.

The second point was to enlist the active sympathy of the different associations of employers. Here we were assisted from the outset by our own school workshop, for the employers, seeing apprentices taking an increased interest in their work and finding them more efficient, gave our teaching the credit. In order to gain the support of the associations we permit them to inspect our schools, to advise us regarding their progress and to assist us in the choice of foremen and journeymen as teachers and invite their opinion on the syllabus of instruction. In return for these opportunities, we expect them to supply models, tools and machinery, and also, within reason, raw materials, to make attendance possible during more suitable hours of the day and to put pressure on apprentices to attend the regular classes.

New Schedules Adopted.

And we have found that the more the employers use these opportunities, the readier they are to make sacrifices for the schools, and the more they appreciate the value of the work being done, the more they become conscious of community of interests.

The trade continuation schools being thus fairly started with the good will of the employers' associations, it was possible to attack the third group of difficulties, the schedule. We demand from eight to 10 hours per week, according to the trade. In addition we arrange voluntary classes or special courses for further practical training and for gymnastics. We have decided to give no instruction on Sunday and to arrange no compulsory attendance in the evenings after workshops are shut. As a rule, we demand at least two afternoons per week from 2 to 7 p. m., or one afternoon and one morning, or one whole working day. We have instances where the apprentices come at 7 a. m. and remain till 6 p. m. The associations of employers have shown themselves ready to give us an increased amount of time and the more the employers become aware of the advantage of the school the readier they are to comply with our requirements. In return, we pay attention to the social and economic conditions of every single trade. We use the dull season more for instruction than the busy time, and we can always arrange short courses for workmen out of employment. Builders and decorators receive 12 hours of instruction from 5 to 7 p. m. every week from Oct. 15 to Mar. 15. For the rest of the year they get three hours on a week day. Other trades get 10 hours per week for eight months of the year instead of nine hours per week for the full term of 10 months. In all cases the organization is the result of an understanding with the representatives of the trade concerned. But however varied the details there is a general agreement on the main principle: that every apprentice must attend the continuation school during the whole time of apprenticeship or until the completion of his eighteenth year.

These three features of the new organization have inspired the school with vigorous life. Never has it become so evident that a rational education produces marvelous results not only in the pupil but also in the employers, and that with the pleasure of successful work the harsh selfishness of the individual is disappearing, that the need for forming one great community is felt and that the hope of a good harvest strengthens the readiness for sacrifice.

The growth of common interest has been as noticeable among apprentices as among employers. The man at the next bench has become a comrade partaking of the same pursuits and a critic worthy of attention. The teacher is no longer a stranger, but a foreman or journeyman of the pupil's own trade with whom later he may have to cooperate, whose rival he may possibly become, one who nevertheless is endeavoring to develop in his juniors the qualities which will make them worthy successors. The red tape of the educational authority and the suspicious visits of the attendance officer disappear. The pupil is conscious of the support of the employers' association, whose personal sympathy and unselfish care soon enlist his support in its favor. Thus an esprit de corps flourishes and promises to yield us later that sense of public spirit which we call love of country.

Thus the ground is being prepared for our fourth and main task; the inculcation of civic responsibility, by which I mean the recognition of the relations between the interests of the individual and those of the community and a just appreciation of the tasks the state has to fulfill. When the boy's soul has been aroused by the practical work of the school there is no longer any difficulty in rendering his mind susceptible of this training. The interest he takes in his trade is increased when he comes to study the history of his trade, which is necessarily connected with the history of mankind in general. By observing the rise and decay of his vocation in the course of ages he is introduced to the complicated conditions of the present day. All this instruction must, of course, be of an elementary kind and based on illustration by concrete example. By giving one hour per week for three or four years to this instruction we manage to get most of our pupils to understand the functions of our economic, social and political institutions. They come to consider not only their personal position and the position of their trade, but their views expand to a consideration first of their native country, and then the complicated conditions of international intercourse.

The essential features of the compulsory trade continuation schools are thus summed up in these four points: practical work is provided for a center of interest; the active co-operation of employers on the one hand, and of trade societies and guilds on the other, is enlisted on behalf of the schools; the time of instruction is sufficient in amount and excellent in quality, and finally, every opportunity that presents itself for training the citizen is utilized.

Present Enrollment Large.

During the present year we have in all about 9,400 boys between the ages of 14 and 18 and about 2,700 journeymen as pupils. In the year 1911, when the original class of apprentices will have completed the full course, we expect to have 10,000 boys and about 3,600 journeymen enrolled in these schools.

The organization of the trade continuation schools will be best explained by considering the engineers' school. This is open to all apprentices in engineering, electrical and instrument-making works. It has four consecutive grades, each representing a year of school life. The school meets for nine hours per week. The teaching is taken on week days either in the mornings or in the afternoons, but never later than 7 p. m. Those apprentices who wish to get more practical work may attend optional continuation classes from 7 to 9 p. m. If an apprentice does not make satisfactory progress he may be required to repeat attendance at a class for a whole term. The engineers' school has at present 500 to 600 apprentices who are taught in about 24 classes.

To educate the rank and file of the people in this manner—the boys from 14 to 18 years—is naturally expensive, but the continuation schools are not

so expensive as the primary schools. The average cost of the primary pupil is $24 per annum, while in the compulsory continuation school for boys it is $18 per annum. During the present year our primary schools with 70,000 pupils cost $1,700,000, the boys' continuation schools, with 9,400 pupils, cost $300,000.

These schools only at present exist in this perfection in Munich. I have already said that Wurtemburg has adopted the same organization, that similar institutions are to be found in Baden, that the canton of Zurich in Switzerland, has quite recently promulgated a new continuation school law, which in many respects resembles its Munich predecessor, and that finally, the city of Vienna has erected at enormous cost a central building for apprentices' continuation schools, the framework of which is exactly the same as in Munich. Thus you see that South Germany, Austria and German Switzerland have started on the road of Munich's continuation school organization. In north Germany the greatest energy is being expended, too, on the problem of compulsory continuation schools, but at present without any attempt to base the organization on the school workshop.

The reason for this must not only be sought in the fact that pedagogical opinion in Germany is still very strongly permeated by the idea of so-called general culture, but also in the difference between the south German and the north German employer. The latter is mostly an ardent opponent of the school workshop. And another reason is, perhaps, the difficulty with which organizers and school men can make up their minds to accept the innovations of a colleague. It is a fundamental characteristic of human nature that everyone who has a question to solve likes to have contributed his own share to the solution. There is a German riddle that illustrates what I mean: "What is the difference between God and a German professor?" and the answer is, "God knows everything, and the German professor knows everything better." This knowing better is always a hindrance for the quick realization of a good thing. Experience will show that the purely theoretical continuation school which entirely avoids practical teaching, will not fulfill its purpose.

I can give no better illustration of what I mean than in a quotation from Prof. John Dewey, in his "Moral Principles of Education:"

"I am told that there is a swimming school in a certain city where youths are taught to swim without going into the water, being repeatedly drilled in the various movements which are necessary for swimming. When one of the young men so trained was asked what he did when he actually entered the water, he laconically replied, 'Sunk.' The story happens to be true; were it not, it would seem to be a fable expressly for the purpose of typifying the ethical relationship of school to society."

SWITCH AND SIGNAL PLANS OUTLINED TO STOCKHOLDERS.

Directors of the Union Switch & Signal Co. have authorized a circular to be sent to all stockholders of that corporation, outlining the plan for the issuance of 10,000 shares of new stock of the company. Stockholders of record of Dec. 31 will be permitted to subscribe for one-fifth of the amount of their holdings on that date, at $75 per share, and the payment will be in three installments. This carries out the plan for the stock increase of the Union Switch & Signal Co., which provided for the stock dividend of 60 per cent without payment by the share owners and the issuance of 10,000 shares for increasing the capital of the company.

WILL DISCUSS FREIGHT RATES.

W. H. Stevenson, chairman of the transportation and railroads committee, and Ira S. Bassett, traffic manager of the chamber of commerce, Pittsburg, have called a joint meeting of members of the committee and representatives of the coal and coke interests to be held in the Keenan building, Pittsburg, Jan. 7, to discuss questions relating to the freight rate situation on coal and coke shipments to lake ports.

ST. LOUIS SHIPMENTS.

Receipts and shipments of pig lead and spelter at St. Louis for the last two weeks were as follows:

	Zinc and spelter.	Pigs of lead.
Receipts:—		
For week ending Dec. 17.....	57,600	69,320
For week ending Dec. 24.....	101,700	111,850
Shipments:—		
For week ending Dec. 17.....	88,700	23,400
For week ending Dec. 24.....	95,540	32,260

Display of Motor Trucks.—A display of motor trucks and delivery wagons will be held at the Coliseum, Chicago, during the week of Feb. 6 to 11, under the auspices of the National Association of Automobile Manufacturers, and will follow immediately after the annual automobile show, held at the same place. It is estimated that 100 models of commercial vehicles, representing a quarter of a million dollars in value, will be displayed.

DYNAMITE USED

To Damage Plant of Llewellyn Iron Works.

San Francisco, Dec. 27. (By wire.)

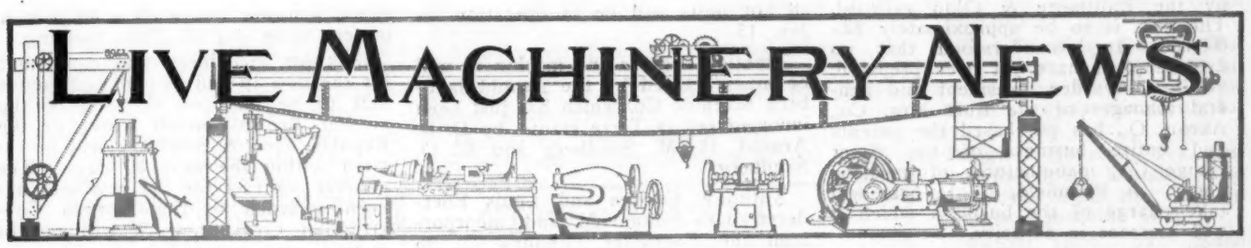
A dispatch from Los Angeles states that the plant of the Llewellyn Iron Works, that city, was seriously damaged early Sunday morning by an explosion caused, according to the investigators, by a charge of dynamite. The office of the works and the upper story of the building attacked were entirely demolished and the main building was also badly battered. No lives were lost.

The Llewellyn company has for a long time conducted a defensive labor struggle, and it is one of the firms which, when the metal workers' strike went into effect, on June 1, 1910, refused to accede to the union workers' demand for an eight-hour day and a uniform wage rate of 50 cents per hour. The struggle was precipitated by a notice from the men engaged in the metal trades in San Francisco that the employers there had made concessions to their employes on condition that they should not thereby be placed at a disadvantage in competition with non-union Los Angeles firms. Much feeling has been displayed by both sides in the conflict and it is the opinion of the Llewellyn officials that the outrage was perpetrated by union men. This, in turn, is denied by union leaders.

FOREIGN RAIL SALES.

There is no alteration in the position of the steel rail trade, where orders remain exceedingly scarce, and there are no indications of reviving interest, says The Ironmonger, of London. The East Indian order for 11,000 tons of 88½-pound b. h. rails has gone to Guest, Keen & Nettlefolds (Ltd.), and the 5,000 tons of tram rails for the London County Council to Walter Scott (Ltd.), of Leeds. No definite decision has been arrived at respecting the Pekin-Kalgan inquiry, and this, together with the 1,200 tons of 85's for the Dublin & Southern railway is at present the only new business in view.

Go in Body.—The Philadelphia Foundrymen's Association is making arrangements to attend in numbers the annual dinner and entertainment to be give by the New Egland Foundrymen's Association, at Boston, Jan. 11. The trip is to be made in a special car and by way of the steamer Maryland. A number of reservations for the trip have already been made. The Pittsburg and Newark, N. J., associations have also been invited to attend the affair.



CHICAGO

Business Quiet.—1910 Did Not Come Up to Expectations.

Holiday quiet has settled over the machinery market in this territory. Looking back over the year, the trade is in general satisfied although it must be admitted that 1910 did not come up to the expectations which were entertained early in the year. There will be considerable new construction in this territory next year and this, coupled with an expected revival in railroad buying, ought to produce an active demand for machinery.

We are advised by the Pontiac Motorcycle Co., which is building a new plant at Pontiac, Mich., that it is in the market for the following equipment: Steam drop and helve hammers from 100 to 2,500 pounds; shears; trimming and stamping presses; oil burning furnaces for forging and heat treating blowers; oil tanks and complete die shop equipment; also polishing and plating devices, oil brazing stands and portable enameling ovens. The company has now under construction three buildings of the following dimensions: One, 45 x 208 feet; one, 55 x 100 feet and one, 55 x 128 feet. The company is capitalized for $100,000, and the officers are as follows: Robert M. Brownson, president and general manager; Max F. Wollering, vice president; Harry L. Stanton, treasurer; James G. Book, secretary and Richard E. Baus, purchasing agent.

B. V. Hubbard, commissioner, appointed by the state of Indiana to investigate the practicability of constructing a plant to supply the state capitol ot Indianapolis with water, light, heat and power, has made a report embodying his recommendations for the new construction to Governor Marshall, who will probably transmit the matter to the legislature. The estimated cost of the new plant is $105,346.

The Lakeside Paper Co., Inc., Menasha, Wis., advises that it expects to build a new paper mill in the near future but has not yet fully decided on the details. The company states, however, that it is in the market for the entire equipment including power generating and transmitting machinery and such special machinery as will be necessary for the manufacture of paper.

A boiler house will be constructed in connection with St. Joseph's Home and St. Vincent's Orphan Asylum, Chicago, for which Worthman & Steinbach, 1859 West Chicago avenue, are architects. Space will be provided for five tubular boilers of which three will be installed at once. The size of the boilers and other details are as yet undecided.

The Meek dam at Bonaparte, near Keosauqua, Ia., has been purchased by S. E. Irish, Keosauqua, who is organizing a company to rebuild it and install a hydro-electric plant to develop 1,200-horsepower. J. A. Johnson, Bonaparte, Ia., is financial manager and George H. Craig, Keosauqua, is consulting engineer.

The Northern Machine Co., Milwaukee, Wis., is building a new machine shop at Thirtieth street near North avenue. Kirchoff & Rose, Majestic building, Milwaukee, are architects. The shop will be 60 x 125 feet one-story, and will cost, with its equipment, $75,000.

J. J. Quinlan, 2327 North Pennsylvania street, Indianapolis, Ind., is erecting a one-story brick building at Van Buren and Drapier streets, which will be used for a boiler factory. The plant will have 35,000 square feet of floor space and will cost $20,000.

It is reported that the American Can Co., Maywood, Ill., is building a new pattern shop and that the present pattern shop will be used for die and tool departments. Additional equipment will be required, including machine tools and electric motors.

H. S. Swanson, J. M. Johnson and G. A. Dietz have incorporated the Swanson Mfg. Co., Marseilles, Ill., with paid up capital of $250,000. The company expects to erect a plant and manufacture farm implements and machinery.

A. Claussen, consulting engineer, German-American Bank building, St. Paul, Minn., has awarded a general contract to the Toloz Engineering Co., St. Paul, for a new electric light and power plant for the city of Brainard, Minn.

The Batten-Dayton Motor Co., Chicago, has been incorporated with a capital of $125,000, to manufacture motors and accessories. The incorporators are: W. O. Dayton, M. A. Dayton and E. S. Carr.

The Western Machine Co., Eau Claire, Wis., recently incorporated by P. J. Holm and associates, has secured temporary quarters, but will erect a plant in the spring for the manufacture of gas engines.

The Crown Iron Works, Minneapolis, Minn., J. W. Hernlund, manager, is building an addition to its plant at Thirteenth and Taylor streets, N. E. The building will be one-story, 74 x 150-feet.

John Prince, 218 West 112th street, Chicago, is constructing a machine shop at 419 West Eleventh street, for which the general contract has been let. The building will cost $2,000.

The city council, Bluffton, Ind., has passed an ordinance authorizing the purchase of a new engine and other new equipment for the city electric light plant.

The village of Atlantic, Ia., is issuing $50,000 bonds for improving the electric light and power plant and uniting it with the water works system.

The Southeastern Missouri Ice, Light & Power Co., Charleston, Mo., expects to add one engine and two boilers to its present equipment.

It is reported that a new engine and generator will be added to the plant of the Sikeston Ice, Light & Power Co., Sikeston, Mo.

The Dexter Light & Power Co., Dexter, Mo., M. B. Eicholtz, proprietor, is in the market for a 75 or 100-horsepower Corliss engine.

The Atchison Railway, Light & Power Co., Atchison, Kas., has begun work on a concrete machine shop at Falls City, Kas.

CLEVELAND

Holidays Bring Lull In Business.—Good Inquiries Expected Out Feb. 1.

The approach of the holidays was probably responsible for the absolute dearth of business in the machinery line last week. Inquiries and sales dropped away completely and nothing of interest occurred. It is not expected that anything important will develop before Feb. 1, when some desirable business is expected to be submitted. According to official announcement, the Lake Shore railroad will put out a large tentative list at that time. It will include complete mechanical equipment for the large locomotive repair shop which this railroad is erecting at Elkhart, Ind., and which will accommodate 24 locomotives. This road will also probably send out inquiries for machinery for its Collinwood, Cleveland, shops.

The S. G. Taylor Chain Co., with factories in Chicago and Maxwell, Ind., reports that it is tearing down the latter plant and will re-erect the same at Hammond, Ind. The plant at Hammond will also include a new building in which the forges of the present Chicago works will be installed. Thus both old plants will be abandoned and the entire manufacturing department concentrated at Hammond, and this plant will finally contain between 50 and 100 forges which will be in operation next summer. The company will continue to make a full line of iron and steel welded chain, hand-made and machine-made, from 3-16 up to two inches in size.

It is reported officially that new shops are to be built at Newark, O.,

by the Baltimore & Ohio railroad. The cost is to be approximately $2,000,000. It is understood that no definite plans have yet been prepared.

W. F. Warden, president and general manager of the Burt Mfg. Co., Akron, O., has purchased the patents and entire business of the Freer Gauge Co., manufacturer of gasolene gages. A Plainfield, N. J., firm will take charge of the business which it will increase in capacity.

The Northern Engineering Works, Detroit, reports the following recent sales of Newton cupolas: One six-ton to the Middleby Auto Co.; one 12-ton to the Modern Foundry Co.; one six-ton to the Dake Engine Co.; one one-ton to Washington university; one five-ton to the Michigan Crucible Steel Castings Co.; one 12-ton to the Southern Iron & Steel Co. The Northern Engineering Works reports record sales during the past six months.

The Enterprise Electric Fixture Co., Cleveland, A. Oppenheimer, president, 5307 Euclid avenue, will shortly establish a shop for assembling and repairing electric light fixtures. This concern is in the market for a drill-press and a few other tools with which to equip a small machine shop.

The Friend Mfg. Co., Berthold Friend, president, Mansfield, O., will engage in the manufacture of machinery. No definite plans have yet been made. The company was only recently incorporated.

William Garstang, superintendent of motive power, C. C. C. & St. L. railway, Indianapolis, reports that notwithstanding current reports, his road does not plan to erect new shops at Springfield, O.

INDIANAPOLIS

Many New Industries Under Way.

A company to be known as the Storck-Browning Carpet Sewing Machine Co. will be incorporated within the next few days with an authorized capitalization of $100,000 and in the spring will erect a large factory building. Plans have been ordered for a three-story, brick factory building, 60 x 125 feet, to cost $25,000. The machine to be manufactured is the invention of J. H. F. Browning, Dayton, O.

A foundry and machine shop has been established at Wabash, Ind., by the Wabash Foundry & Machine Co., of which G. N. Barcus, A. B. Rowley, J. I. Robertson, C. S. Haas and N. G. Hunter are the directors and principal stock holders. The company has been incorporated with an authorized capitalization of $50,000.

The Interstate Car Co., which has a large plant at the suburb of Brightwood, east of Indianapolis, suffered a loss of about $5,000 from fire a few days ago. The company is preparing to rebuild at once that portion of the plant which was damaged.

Six additional hot mills have been started at the Elwood, Ind., plant of the American Sheet & Tinplate Co., making 14 hot mills that are now operating. It is expected that at least 28 hot mills will be in operation by Jan. 15.

Traction engines and machinery will be manufactured by the Arnold-Sandberg Machine Co. which has just been incorporated at Terre Haute, by D. B. Arnold, H. M. Sandberg and C. O. Sandberg.

Anthony, George and Louis Foerderer have organized and incorporated the Foerderer Foundry Co. in Indianapolis with an authorized capitalization of $10,000 and will establish a foundry.

PITTSBURG

Business Light—Extensive Program Expected for 1911.

Actual bookings in the local machinery trade are exceedingly light. Inquiries noted recently are still pending, but it is not likely that any large awards will be made until the middle of January. Several plants are closed for the holidays and will not resume operations until after Jan. 1. On account of inventory activities the machinery trade has been given little attention during the past week. There is a large number of enterprises under construction for 1911 and a busy season is expected, even though only a portion of the proposed new work is authorized. Division officials of a number of the larger railroads have forwarded to the general offices of their respective roads a list of shop extensions, terminal improvements, etc., for 1911, but the trade has not yet been advised as to what amount of machinery will be required. In this connection it is stated that the Baltimore & Ohio Railroad Co. has prepared plans for new repair shops to be located at Newark, O., which will mean a total expenditure of approximately $1,500,000.

The Mesta Machine Co. has a fair volume of business on its books. The 84 and 48 x 60-inch compound Corliss engine built at the West Homestead plant for the Republic Iron & Steel Co. plant at Youngstown, is being shipped this month. The Republic Iron & Steel Co. has awarded several additional small contracts for equipment for the new open-hearth steel plant, which will be ready for operation about April 1, 1911.

All of the Westinghouse companies, with the exception of the Westinghouse Air Brake Co., continue to receive a large volume of business for the year. Several traction companies are figuring on extensions to present lines and power stations in 1911, and, with the increased buying on the part of public utilities companies, the prospects for these plants during the early part of the year are very bright.

It is expected that contracts will be awarded shortly after the first of the year for the new plant to be built near Tarentum, Pa. by the United States Engineering & Mfg. Co. As outlined recently, this plant will consist of a machine shop 300 x 120-feet; a foundry building of the same dimensions, a power house 80 x 40 feet, a pattern shop and an office building.

Bids for machinery and equipment for the new 16 and 14-inch continuous mill to be built on the site of the present Brown-Bonnell works of the Republic Iron & Steel Co. will be invited within the next 30 days. The general contract for the new mill has been awarded to the Morgan Construction Co., but work will not be started until about Feb. 1.

The Pittsburg chamber of commerce reports that the movement started recently to encourage small factories and manufacturing plants to locate in the Pittsburg district has resulted in a number of prospective builders making inquiry regarding sites, etc., and the indications are that some new plants will be built during the coming year.

Local companies are submitting bids on new water and electric lighting plants to be built early in the new year for several small cities and towns in Western Pennsylvania.

NEW YORK

Little Activity in Market.—Single Tool Buying.

Business has been very quiet in the New York machinery market during the week. Both buyers and sellers are engaged with the routine work of closing up the year. A fair volume of new inquiries came into this market, and the accumulation of this prospective business now represents a large total. Little disposition to close on bids, however, is shown, except where the equipment is indispensable.

The Wells-Boughton Co., Troy, N. Y., has submitted the lowest bid for the construction of a power house and for the equipment at the Crescent dam of the state barge canal now building. Construction contracts just awarded in connection with this project include No. 48, to the Crowell-Sherman - Stalter Co., Cleveland, at $1,701,671; No. 51, to George T. Cunningham, Utica, at $389,842; No. 76, to T. A. Gillispie Co., New York, at $1,494,057; No. 77, to the T. A. Gillispie Co., New York, at $1,652,148. On the Cayuga and Seneca canal portions of the work, Scott Bros., Rome, N. Y., are the low bidders at $393,135 for the construction of locks and controlling works in the Seneca river and the Crowell-Sherman-Stalter Co., Cleveland, is low for 17 miles of dredging work at $1,448,550.

The New York Central and Pennsylvania railroad companies have closed for one and two machine lots, to meet immediate requirements, but there is still a large total of business from those two companies represented in specifications put out two and three months ago, which are yet to be closed. Dealers report that so far not much complaint has been heard from the plants of machinery builders, over a scarcity of orders.

The up-state public service commission has authorized the Hartwick Power Co. in Otsego county to execute a mortgage of $750,000, of which

$400,000 in bonds will be issued presently to cover the payment to the Susquehanna River Power Co., for the purchase of a hydroelectric development system on the Susquehanna river at Colliers, Ostego county.

Bids have been opened by the trustees of public buildings for the construction of a new power house to heat and light capitol buildings at Albany. The R. T. Ford Co., which now has the contract for erecting the state education building has submitted the lowest bid but no award will be made for a week or more.

The contract for a can factory to cost $100,000 for the Standard Oil Co., at Constable Hook, in the lower Bayonne, N. J. district, has been awarded to the Turner Construction Co. The building will be of brick construction, 153 x 300-feet, two stories and will cost about $100,000.

The city of Harrisburg, Pa., has awarded the contract to Stapf & Benfer of that city, for the construction of a new pumping house, which with connections and a new reservoir will entail an expenditure of $125,000.

Plans for a municipal water filter plant and public water works system have been approved by the state authorities for Masontown, Fayette county, Pa.

Mokoma Spring Water Co., Laporte, Pa. will construct a water works system. Capt. E. S. Chase, Eaglesmere, Pa., is the engineer in charge.

LOUISVILLE

Machinery Market Quiet—Good Outlook for Power Equipment.

The machinery situation in this market is quiet, as was to have been expected at this season. Manufacturers of power equipment report the demand sluggish now, although there is a good deal of business in prospect after the holiday season is over. Bad weather has interfered with building operations considerably, and dealers in contractors' supplies have found little demand from that direction.

The Harris Oil Burner Co. has been incorporated here with a capital stock of $20,000 for the manufacture of a patented petroleum burner. Lee Harris, M. I. Greenstein and Otto Cohen are the incorporators.

The Kentucky Wire & Iron Works has incorporated with a capital stock of $2,000. Those interested in the company are A. L. Ducker, J. A. Ducker and H. B. Fleece.

The Anglo-American Milling Co., which has been erecting its mills at the plant of the Kentucky Electrical Co., manufacturer of electrical apparatus, at Owensboro, Ky., is considering the establishment of a plant at Evansville, Ind.

The Trenton, Tenn., Electric Light Co. has incorporated for the purpose of taking over the plant of Keenan, Wade & Wade. It will be greatly improved and enlarged.

The Standard Tag Co., Nashville, Tenn., manufacturer of metal tags, has increased its capital stock from $15,000 to $30,000. C. J. Crawford is president.

Manchester, Tenn., is contemplating an issue of bonds for the purpose of building an electric light plant and water works system.

The Brisol, Tenn., Metal Mfg. Co. has increased its capital stock $10,000.

NEW ORLEANS

Demand Increases—Oil Drilling and Wood Working Machinery Active.

Demands for machinery in this territory have been much increased during the past week. There were several causes for this, the principal one being fires in the saw mill districts. Inquiries for oil drilling machinery continued active, however, and general development seemed to be indicated by the requests for bids from smaller concerns on construction and other improvements.

The following oil companies are in the market for supplies and machinery: Home Gas & Fuel Co., Claremore, Okla.; Avant Rex Drilling Co., capital $10,000, Bartlesville, Okla.; The Gladys-Velle Oil Co., capital $10,000 of Tulsa, Okla.; the Van Buren Oil & Gas Co., of Ft. Smith, Ark., and the Pay Streak Oil Co., of Markham, Tex., C. G. Hamil, driller.

Plans are under way for a new rice mill at Crowley, La. The enterprise will probably be constructed by the state of Louisiana, in order to have a model rice mill. Specifications will be issued within 30 days, it is stated, and local machinery agents are preparing to bid. The mill will cost about $60,000.

The wood working plants in the market for machinery are: The Gayler-Wilbur Handle Manufacturing Co., Hugo, Okla.; the Deakle Lumber Co., Bayou la Batrie, Ala.; the Red Star Lumber Co., Ltd., Many, La., capital $50,000, O. S. Jones, president; and the Baxter Lumber Co., Cookeville, Tenn.

A county court house, involving much iron work, machinery, boilers, etc., is to be built at Beeville, Tex. Plans and specifications are to be had by addressing Stephenson & Heldenfels, architects at Beeville.

The city commissioners of Ft. Worth, Tex., have called an election for the purpose of ratifying a bond issue of $2,000,000 for the construction of a reservoir and a town waterworks system.

At Rock Hill, S. C., a municipal electric light plant is to be built to cost $5,565. Wm. M. Keller, Rock Hill, has the contract and is soliciting bids for machinery and supplies.

The Sallisaw Ice & Fuel Co., Sallisaw, Okla., was organized last week with a capital of $20,000. B. Patrick, president, is asking for bids on machinery and refrigerating apparatus.

The Southern Iron & Steel Co., mills at Gadsden, Ala., will increase the output of its finishing mills by about 200 tons. The capacity will then be 400 tons daily.

At Vicksburg, Miss., the Delta Ice & Cold Storage Co., is installing boilers and iron work. The Vicksburg Boiler Works has the contract, which amounts to $10,000.

The Union Brewing Co., capital $150,000 has given orders to Architects Toledano and Wogan of New Orleans to prepare specifications for a brewery.

C. H. Ruggles, Houston, Tex., announces that the South Houston Iron Works will soon begin the erection of a foundry and machine shop.

Fort Townson, Okla., has issued $13,000 in waterworks bonds and Yukon, Okla., has issued $30,000 in bonds to build a waterworks system.

The Eller Wagon Works, Houston, Tex., was incorporated for $40,000 last week and is soliciting bids for wood working machinery.

The city of Abilene, Tex., has issued $7,000 in waterworks and improvement bonds. Plans will be issued in about 60 days.

The Missouri & Arkansas Lumber Co., Hamberg, Ark., which was burned recently, will be rebuilt and the company is open for bids.

Hominy, Okla., has issued $25,500 in bonds for waterworks and $10,500 for a sewer system.

The town of Bridgeport, Okla., has issued $6,000 bonds for waterworks.

DETROIT

Not Much Actual Business But Some Good Prospects.

As was to be expected there was not much business in machine tools during the past week. A few prospects developed which may result in orders shortly after the first of the year, and there also were a few orders placed for deliveries in January.

The Federal Motor Car Co., now located in a small building on Kirby avenue, has just closed a lease for the factory buildings formerly occupied by the Warren Motor Car Co. just south of Michigan on Isabella avenue. The buildings are being remodeled to suit the motor truck business and will be occupied shortly after the first of the year. A small list of machine tools has been purchased to take care of present requirements, and more will be added from time to time.

The new plant of the Universal Motor Truck Co. is practically complete. It consists of a main building, 84 x 258 feet, four-story. It is built of the "flat slab" construction without girders or beams. The boiler house is a one-story building, 75 x 140 feet. The plant is located along the Grand Trunk railway between Farnsworth and Theodore streets, thus providing unusual shipping facilities. The building is one of the best equipped factories in this city.

The Erd Motor Co., Saginaw, Mich., reports 1910 as one of the most successful years in its history. Its business for December, usually very quiet, has been above normal. The company expects to purchase more machinery if this condition continues.

Nelson Brothers Co., Alma, Mich., has just made quite an addition to its machine equipment by adding a milling machine, shaper, lathe and a number of drill presses.

CINCINNATI

Fair-Sized Contracts Received Recently—Outlook Considered Good.

Machine tool interests will take advantage of the usual midwinter lull and devote the greater portion of the next week or two in taking inventories, and the general overhauling of their plants. A little better feeling seems to pervade the minds of several of the larger manufacturers who have been fortunate in receiving a number of fair-sized contracts during the past week. This demand appears to be more in the line of larger and heavier machines, and, while most of it comes from railroad interests, there has been some call from other sources that have been quiet for some months past. Salesmen who cover the territory are of the opinion that it is but a matter of a few months before the buying movement will be strengthened, and they anticipate a bright future. Local foundries are running on short time and melt about 60 per cent of their normal heats. New contracts for castings for 1911 business are now under advisement.

The Mastic Wall Board and Roofing Co., with offices on Third street, is said to be contemplating the erection of several buildings for manufacturing purposes. The British American Rosin Co., now located on Front street, is also said to be contemplating a similar move, which will also embrace new machinery. Both new plants will be built on Spring Grove avenue, Cincinnati, O.

The Universal Motor Co., a $50,000 concern recently incorporated under the laws of Arizona, for the manufacture of large motor trucks under a new patent, and in which some Cincinnati capital is interested, is said to be looking for a manufacturing site in this city. The company now has temporary quarters at Indianapolis. F. H. Summerill, Denver, Col., is president.

The Auto Tire Interlining Co., a new corporation, of which William Stacey is president and G. S. McDuff secretary and treasurer, has leased a portion of the building at the southeast corner of Eighth and Broadway, Cincinnati, and will equip it with machinery for the manufacture of a patented inner tubing. The company is capitalized at $25,000.

The Baldwin Tool Works, Parkersburg, W. Va., will probably be ready to commence operations about Feb. 1. A fine new plant, which will soon be ready for equipment, is now being completed. The output will be shovels, plates and scoops.

Schumacher & Boye have received several orders for large size lathes, mostly from railroad interests. Their plant is running at practically normal capacity, but new trade is not of sufficient proportions to carry the work very far into the future.

A 60 x 43-foot, six-story, concrete addition is to be built by the American Diamalt Co. Plans are also under advisement, which will include an extensive addition to the power plant, including new machinery for same.

The Dietz Mfg. Co., builder of electric washing machines has leased the property at 808 and 810 Elm street. It is understood that the plant will be enlarged, and new machinery added.

NEW ROLLING STOCK

Will be Purchased by Canadian Pacific Railroad.

Toronto, Dec. 27.

The Canadian Pacific railway has decided to spend about $7,000,000 on new rolling stock to be turned out in time for the movement of the grain crop of 1911. The greater part of the work will be done at the company's Angus shops, Montreal. Orders have been placed for 75 locomotives, of which one-third will be built at the Angus shops, one-third at the Kingston Locomotive Works and the remaining third at the Montreal Locomotive Works. At the Angus shops 2,000 cars and 200 passenger coaches will be built. The Dominion Car & Foundry Co. has received orders for 2,000 steel frame box cars, of 80,000 pounds capacity, and contracts for 500 stock cars and 800 flat cars have been placed with other firms.

The Montreal Steel Works has declared a dividend of 10 per cent for the year, being an increase of 3 per cent over the highest figure previously paid.

CANTON ROLL FOUNDRY HAS BEEN ABSORBED.

The American Roll & Foundry Co., Canton, O., manufacturer of chilled and sand rolls, rolling mill machinery and heavy castings, has been taken over by the United Engineering & Foundry Co., Pittsburg, and will continue operations as the Canton branch of the Pittsburg company, under the present local management. Additions to the plant are under consideration, and will probably be made early next spring.

NEW DETROIT WAREHOUSE.

R. B. Ridgely, Detroit, announces that on May 1 the new warehouse and offices will be established at 127 to 141 Congress street west, corner of First street. The new warehouse covers a ground floor space of 1,800 square feet, and modern methods and machinery have been installed for rapid and economical handling of bar and other kinds of steel.

The annual meeting of the Midvale Steel Co., Philadelphia, will be held Jan. 9.

LABOR INVESTIGATION

Of Iron Industries Will Last Two Months More.

Washington, Dec. 27.

The investigation of labor conditions in the iron and steel industries, which was ordered by congress at the last session, will not be completed for several months. The bureau of labor is conducting its inquiries by separate classifications, and at the present time its agents are confining their attention to blast furnaces. This section of the report is expected to be ready for publication in about two months.

The bureau's reason for adopting this piecemeal system lies behind a desire to publish the facts gradually rather than run the risk of precipitating the labor agitation which often follows the publication of any comprehensive compilation of labor statistics.

NOTABLE RECORD MADE BY CANAL DOVER STACK.

The Canal Dover, O., blast furnace of the Penn Iron & Steel Co., which has been in blast two years on Nov. 19, has made a remarkable record of output under General Manager M. McMurray and Superintendent P. R. Conlin. During the two years, it has made 4,338 casts of iron, a total of 253,692 tons, showing an average sulphur content of 0.029. The average heat for the period was 750 degrees. The coke used the first year was 2,100 pounds per ton of iron output, and for the second year, 2,163 pounds. Out of the total 4,338 casts there were 81 which showed over 0.05 in sulphur. Of the 81 casts, 41 gave an average of 0.054, and the other 40 an average of 0.066 in sulphur. The grand average of sulphur on all casts is 0.029 per cent.

TO BUILD PIPE LINE.

The Lexington Water Co. will build a pipe line 7 miles from Lexington, Ky., to Greendale, where the school of reform is located, the company having been awarded a contract for supplying water to the institution.

A steel viaduct is to be built at Maysville, Ky., for the purpose of elevating traffic above the tracks of the C. & O. and L. & N. railroads. The cost of the proposed improvement, which is being designed by City Engineer Walker, is estimated at $150,000.

REVISION BY SCHEDULE

With Aid of a Tariff Commission Now Seems Probable.

Washington, Dec. 27.

Current developments show that the Payne-Aldrich tariff is rather more of a permanent institution than the recent elections would seem to indicate, and that the same congress which enacted the law has in its hands the means for preserving it practically intact for at least six years to come. When Senator Cummins introduced his resolution limiting future tariff revisions to schedule-by-schedule adjustment, there were many who looked for a tariff war then and there. The senate Democrats had openly threatened it, and it was generally expected that the Republican conservatives would "stand pat" in defense of the tariff law they had framed. But the Democrats were wholly inactive, and from the ranks of the "old line Republicans" there stepped forth Senator Aldrich himself to declare in favor of schedule-by-schedule revision.

The real purport of this rather colorless climax has never for a moment been overlooked by those whose perspective admits of taking in the entire situation. Some think that the conservatives are falling into line behind the president, who has emphatically declared himself in favor of tabloid revision; but the real key to the situation lies in the several contemporaneous tariff outcroppings, each of which is now playing the role of a sort of side show to the main issue. Notable among these is the Moon permanent tariff commission bill which was discussed at a hearing before the House committee on ways and means the same day that the Cummins resolution was introduced on the floor of the Senate.

Popular Feeling.

Admitting that to frame a tariff law that will suit everybody is to attempt the impossible, and making liberal allowance for the number of interests which must be sacrificed for the general good, congressmen realize, nevertheless, through pressure from their constituents, that there exists throughout the country an abnormal dissatisfaction which they are bound to appease by tinkering in some way with the tariff. To attempt a comprehensive revision at present would be most unwise; for no real changes could ever be accomplished in the congress which passed the Payne-Aldrich law, while the agitation incident to the attempt would certainly operate to depress business everywhere. Since something must be done, all seem to have agreed upon piecemeal schedule revision with the assistance of a proposed permanent tariff commission, by which they hope to meet the popular demand for action and provide for the ultimate adjustment of tariff to business interests without doing anything violently radical.

The Moon bill provides for a permanent tariff commission whose members shall be appointed for a term of six years by the president by and with the advice and consent of the senate. Two members must have special knowledge of the producing interests of the United States; one must be a lawyer familiar with customs and tariff regulations; one familiar with industrial and commercial conditions and customs and tariff laws of other countries, and one economist and statistician who has given special attention to prices and costs of production. These requirements are flexible, subject to the judgment of the appointing power, and can be made to fit in with other attributes deemed desirable, including that of a known political and economic attitude toward the policy of protection. Senator Aldrich is accredited with having a similar measure under consideration in the senate committee on finance, and it is certain that no tariff commission bill of which Mr. Aldrich does not thoroughly approve will ever pass the present senate; also, it is unlikely that any commission measure drawn up by him will contemplate any material alteration in the present tariff policy. Its purpose will more likely be to establish a six-year schedule-by-schedule commission which will prevent action by the next congress and effectually close the tariff question until the next national election. Senator Aldrich's agreement to the Cummins resolution, therefore, was anything but a "morituri te saluto."

Powers of the Commission.

This much seems a foregone conclusion, the only matters remaining to be agreed upon being such details as the powers with which the new commission shall be vested. It is very difficult at present to determine the exact position of the several congressional factions in this matter. While the house standpatters are believed to really favor the permanent commission idea, they actually jeered at it throughout the hearing before the committee on ways and means. Mr. Gaines, of West Virginia, said with evidently intended sarcasm that such a commission, if clothed with inquisitorial powers, would subpoena the books and testimony of American manufacturers, secure and publish very accurate figures on the cost of production in the United States and thus play into the hands of foreigners, about whose business no such accurate information could be had. The commission created will in all probability have no powers or functions beyond those of a purely deliberative and advisory board. Although the consensus of opinion in the committee is unmistakably opposed to tariff revision by commission or otherwise, its members have by no means intimated that no bill will be reported. On the contrary, the whole tone of the meeting seemed to indicate an inclination to accede to the popular demand and report the bill in some modified form.

A curious, though by no means remarkable, feature in the situation is the fact that none of the proposed revision schemes contemplates the permanency of the present tariff board, as was recommended by the president in his annual message. The tariff board shares the unpopularity of the monetary commission at the Capitol. As a matter of fact, nobody knows any tangible thing about this board or its work, except that it was created to collect data for piecemeal revision and report to the president. At present its status is anomolous. Its members are appointed by the president, but possess no legal relationship to any department of the government. It exists under an annual appropriation of $250,000 to dispose of as it sees fit. Nobody knows what salary its members receive, and its transactions generally have always been shrouded in mystery. In his annual message to congress, the president indicated his desire to have the present tariff board incorporated into any tariff commission which might be formed by stating that he had no objection to increasing the membership of the board.

The latest development in the form of a declaration by Champ Clark in favor of revision by schedule adds to the probability that that plan will prevail.

Copper exports for the week ending Dec. 22 were 9,085 tons, an increase of 3,610 tons; for the month to date, 23,224 tons, an increase of 8,563 tons; from Jan. 1 to date, 290,033 tons, an increase of 944 tons.

The New York Air Brake Co. has declared the usual quarterly dividend of 1½ per cent, payable Jan. 27.

PRESIDENT NORTHROP DISCUSSES GREAT QUESTIONS

The Labor Problem, the Tariff and Other Subjects Handled in a Masterly Manner by an Eminent Educator

Cyrus Northrop, LL. D., president of the University of Minnesota, was one of the three speakers at the banquet of National Founders' Association at Chicago, Nov. 16. Dr. Northrop spoke in part as follows:

It is a fundamental principle, I believe, of foundrymen that in order to mold things into proper shape it is necessary first to make them very hot. I hope I shall not do that to you tonight, for if there is anything that I wish particularly to impress upon you, it is the necessity of keeping cool.

You remember in Victor Hugo's "Les Miserables" the meeting of the bishop and the escaped galley slave, Jean Valjean. You remember that after being treated like a man and brother, Jean Valjean ultimately robs his benefactor of all his silver—an act of such fathomless ingratitude as to make us question whether men actually live who are capable of such an act. But is it not possible for men to live with such little experience of kindness and brotherhood as to actually look with suspicion and fear upon any manifestation of them. Such men are hard to deal with. They are almost always of the criminal class. Society is their foe. They are the foes of society. Fortunately most men have some tender spot in their hearts and they are not insensible to kindness. And happy is the man whose position in life as employer or teacher so touches other lives as to lift them out of despondency or sullenness, and to help them to become all that they ought to be. And doubly happy is the man who having such opportunity to bless others improves it to the utmost. And, gentlemen, it seems to me that you are peculiarly fortunate in having such opportunity.

I have often felt that there was no more desirable position in the country than that of the successful business man. He is busy all the time with what is worth doing. He creates what is of value to the human family. He gives employment to those who can not engage in business for themselves. He can make life pleasant for his employes, and can make his employes better men by the opportunity given them to read and study and by his personal intercourse with them and kindness to them. While prospering himself, he can make the sunshine of comfort enter the homes of all his employes. The wives and the children in all the settlement are happier by reason of what he does. I can hardly imagine a position that offers greater opportunities to do good to others while at the same time caring in the most ample manner for oneself than does the position of the successful manufacturer. And if the successful manufacturer will be careful to look not merely at his own interests but every man also at the interests of others, if while he is grateful for the power and wealth given him he is also mindful of the needs of his poor brothers who are working for him and is truly thoughtful for their happiness, he can not fail to be truly blessed, and in the course of his life he will come to realize that pleasant as it is to make money—it is really more blessed to give than to receive.

Relations With Workmen.

I suppose the greatest trouble you founders have, like most manufacturers, is in keeping up satisfactory relations with your workmen. It is not an easy thing to do. Men are selfish. And most men think other men more selfish than themselves. The manufacturer striving to make his business a success and sometimes perilously near failure, finds himself imperiled in the worst possible moment by the demands of his workmen for increased wages and shorter hours. He naturally thinks that his men are very unreasonable and very ungrateful, considering how long they have had regular work with him and fair pay. The men, considering how small a part of the profit of the business comes to them, how small their wages are compared with what they think the wages should be in view of the increased cost of living or other conditions that may at the moment be conspicuous, the men believe that they are not adequately paid and they demand more. The manufacturer does not think he can safely grant their request, and the men do not think they can live unless the request is granted. The conflict is on. Sometimes it appears to be a case of an irresistible force striking an immovable body, and if you can tell what happens in such a case, you can tell what happens as the result of a good many strikes. But a strike is no joke. It is bad enough for the manufacturer. It is not any better for the workmen. And sometimes it is even worse for the innocent and suffering public than it is for the contestants. Strikes and lockouts ought to be avoided as much as possible. They can generally be avoided if men will control their passions and not get angry. When both sides get angry, the worst is to be feared, and a return to reason can be expected only after protracted suffering on both sides. I believe most heartily in the right of both manufacturers and workmen to act in harmony and for that purpose to form associations or unions. A man standing alone in the business world is in danger all the time. He must have sympathy and help when needed and he is sure to need it some time. The workman standing alone may be treated with injustice and he is helpless. But with a union back of him and union after union back of that, till the whole army of workers in the country stands back of him for his protection he is tolerably safe from any serious or prolonged injustice. The union can make its demands. The manufacturer can grant or refuse what is demanded as may seem to him most expedient. There ought always to be some way of making an agreement by reason, or by compromise or by arbitration without resorting to the wasteful expedient of a strike or a lockout. I think experience has taught the workman as well as the capitalist a good many lessons, and that in most cases if the parties concerned will not lose their temper and will seriously try to reach an agreement that is fair, such an agreement can be reached. And it certainly ought to be reached when it can be.

The Non-Union Man.

But what shall be done with the workingman who does not belong to a union? Has he any rights? It seems to me unthinkable that in the free republic of which we are so proud, the United States of America, a workman must join a union and pay fees and support the organization and do whatever the union says, or else he must be excluded from the privilege of working and earning a living. A man has a right to join any organization, political, religious or industrial, to which he can gain admission, and which he desires to join. He may be a Presbyterian or a Roman Catholic, a Republican or a Democrat, a member of a labor union or not as he pleases. It is preposterous that a man must join some one of these in order to be permitted to live, or what amounts to the same thing, to be permitted to work. I know how natural it is, that men who have struck for higher wages, who have given up their job temporarily as they suppose, should be angered when other men offer to take their places and do the work they have declined to do—but unless such a thing can be, there is no possible freedom of the labor market—business is hampered by conditions very hostile to success, the proprietor is not master of his own business, and an irresponsible oligarchy can dictate to him practically as to whom he shall employ and how much he shall pay. That is altogether too much for a self-respecting body of founders to grant. They should be willing to do justice. But justice requires that they show some consideration for themselves and for workmen who do not choose to join a union, as for the union men themselves.

The great trouble with the American people is that they divide into

two great parties and then fight one another, the object sought being victory. When a good measure is proposed by one party, the other party does not frankly approve of the measure and help pass the laws necessary for the adoption of the measure. On the contrary, it tries to side-track the measure on some technicality, admitting that it is good in intent, but not correct in form—all because they are afraid that the party proposing the measure will get too much credit for it if the measure is adopted. That is politics, but it is not patriotism. Take the tariff for example. Unlike a majority of college officials, especially college political economists, I have always been in favor of protection and opposed to free trade. I have always believed, and believe now, that our country has done well to protect its infant industries. I do not believe that this country would be anything near what it is in its wealth-producing power if we had not had protection. But when our industrial enterprises become as strong as very many of our industrial enterprises now are, it is absurd to talk any longer about the protection of infant industries so far as these are concerned. We all know perfectly well that the duties on a good many things might be reduced without any danger to American industrial prosperity. But we are not in a position to frankly say so and help get the duties reduced, because somebody else is working as hard as possible to keep the duties that affect his interests as high as they now are, and we can not afford to have protection taken from us and let it remain on other people. And so practically the fight goes on, everybody resisting a lowering of the tariff so far as it would affect their business, and as somebody's business would be affected by changing the tariff the result is a fight to the last to prevent a modification of the tariff. This is foolish, but it is inevitable so long as tariff revision is conducted on the "you tickle me and I'll tickle you" principle, with no regard to scientific principles. You never can revise an entire tariff at once without resorting to compromises and trading, letting Louisiana have her protection for rice and sugar, and in return getting her support for the protection of cotton and woolen manufactures. So long as the tariff is treated by congress as it has been in the past, it will be based on no scientific principles, but will be an agreement among the various industrial interests of the country—at a very large and unnecessary expense to the people of the country. Now, under these conditions it has become evident, and has been recognized as evident for a long time, that either protection must be entirely abandoned, or there must be some careful study of the conditions prevailing in countries from whose competition it is desired to protect our industries, so that it may be clearly seen just how much protection is needed to save our industries—and such careful study should be made by a body of experts who examine the whole matter, not as politicians, not as partisans, not even as protectionists or freetraders—but as clear-headed, honest, unbiased business men who can find out what the facts are, can report the facts as they are, and make the conclusion to be drawn from the facts so clear that congress and everybody else can draw the conclusions for themselves. With such a report congress can act on one schedule at a time, and there will be no chance for trading votes. The contest will not be between a product of one section of our country and a different product of another section, resulting in both getting more protection than they need. The contest will be between an unduly high protection and a safe protection, which merely protects without unduly enriching by creating a monopoly or anything akin to it. We know that what is wanted is a tariff commission to study the whole matter and throw the necessary light on the various schedules so that there may be just and righteous legislation without any enriching of the few at the expense of the many. Now, why do we not all do our best to secure the appointment of such tariff commission? And why do we not all stand ready to do our best to secure legislation based upon the findings of such a commission? There are various reasons—some political or partisan, some selfish—it is not necessary to hunt for all the motives for opposition, but a great organization like yours, made up as it is of intelligent and efficient men, ought to be united as one man in favor of such a commission, in favor of scientific legislation based on facts, in favor of getting the tariff out of politics and making it what it ought to be—a rational system of legislation for securing the best success to our manufacturers without oppressing in any degree the ultimate consumers—in fact a business proposition and not a foot ball to be kicked about by political parties for other purposes than either the prosperity of business or the welfare of people in general.

A Rational Tariff.

Now it would seem that on a proposition like that a body of intelligent men like you, all having practically identical interests, and all studying the same business problems, and all helped or injured by the same things, whether material or legislative conditions, it would seem, I say, that you ought to be perfectly united in the support of such a proposition for securing a tariff based on rational principles and in harmony with existing conditions and in favor of eliminating forever the old style of tariff produced by log-rolling and political trades, and I sincerely hope you are so united, and that you will make your influence felt by congress in the very near future. You can not, in my judgment, do a more patriotic thing or one more helpful to the future prosperity of our country.

The existing social unrest, the demand for an unreasonable paternalism on the part of the government, the call for the substitution of a governmental machine for the supply of human wants in place of individual enterprise, all arise from the too general disregard of the command to love our neighbor as ourselves. Human selfishness and greed have disturbed the harmony of life. "Man's inhumanity to man makes countless thousands mourn." But after all, business men are not half as selfish as they are sometimes thought to be. Individually multitudes of them are generous. They are offended by absolute selfishness. They applaud generosity. The same is true of men generally. The world has made great progress in its industrial development during the last half century, and it has become possible for men, by sharp and shrewd combinations, by the exercise of foresight and sagacity, and by the skillful employment alike of talent and capital, to pile up and hold as their own, hundreds of millions of dollars, exceeding the wealth which king Croesus was able to gather from all the rich provinces which he ravaged and ruined, yet if the possessor of all this wealth think only of himself in life and in death, the judgment of the present age respecting him is accurately expressed in words written by Walter Scott more than three-quarters of a century ago:

"For him no minstrel raptures swell;
High though his titles, proud his name,
Boundless his wealth as wish can claim;
Despite those titles, power and pelf,
The wretch, concentered all in self,
Living, shall forfeit fair renown,
And, doubly dying, shall go down
To the vile dust from whence he sprung,
Unwept, unhonored and unsung."

I wish you to notice that selfishness is the same evil thing whether exhibited by the rich man or the poor man. A man surrounded by every comfort may seemingly have less temptation to be selfish than one who, do his best, can hardly satisfy his needs. The comfortable man may be more wicked in his selfishness, because the temptation is less; but after all, his selfishness will be seen to be the same deadly thing as that which rankles in the heart of the selfish man without a dollar. "The wretch concentered all in self," *is* "the wretch concentered all in self," whether he be a millionaire or a pauper. It is well for us to look a fact like this in the face and not to deceive ourselves by supposing that, because we are either this or that, rich or poor, as the case may be, selfishness in us is either better or worse than it is in other men, or men of a different class.

A Competitive Age.

This is a terribly competitive age, and human society, casually looked at, seems like a mighty struggle on the part of everybody to get to the top, no matter who may be thrust down, trodden on, bruised, wounded, mutilated, or murdered in the effort. But this is no true idea of human life today in our country.

Gentlemen, what we all really want is to make the world better, a happier place to live in, and we can accomplish this only by making the people in the world better, kinder, more careful for one another's comfort and happiness. And the first step is to be better and kinder and more considerate ourselves. But we are not required to neglect our own real interests, our business, our happiness.

It is not selfish for a man to take care of himself. He is bound to support himself if he can by honest labor for which he is fitted. And if he spend the money which he earns in providing those comforts which are necessary to the complete development of all his faculties, he is not necessarily selfish; he is making sure that he will not be a burden to society; he is making the most of himself for the

good of humanity. The man therefore who takes care of himself without injuring others, is in the plain line of duty. Whether he does this by the labor of his mind or by the labor of his hands, as an inventor of some mighty machine or in running this machine, does not matter.

Service to Family.

Again, a man is not necessarily selfish because he takes good care of his family. Quite the contrary. Such a man renders a real service to society. This service is nearly all that most men can render. In other words, most men have all that they can do to support their families. But no man who does that and only that need be ashamed. It is a beautiful sight to see a man who earns with his two hands every cent that he receives, support, bring up and educate respectably a family of children. These are his treasures, and self-love, if nothing else, would lead him to care for them. Yet he is practicing the truest benevolence; for he is preparing to leave as a legacy to the world—not a single dollar indeed—but a half dozen clean, industrious, thoughtful, kind-hearted young men and women—his children—for whom he has actually coined his brain and strength, and for whom he would have been willing, if necessary, to coin his heart's blood—his children, who after he has gone will be an element of soundness and strength in society, church and state—and whose descendants to the latest generation, being of honest blood, will do credit to the honest man who toiled so hard to support the children whom he loved. And when I see such men working in foundries or other factories, I always feel that they are the very strength and life of our country, and if I were a founder, nothing else would give me so much pride as to have a body of men like these working for me and helping me, while I did my best to help them.

Schools and Mechanics.

The time has come when our secondary schools should train their scholars in the elementary principles and practice of mechanics, just as in many states they are training the young in the principles and practice of scientific farming. The manufacturer or founder of today does not look for customers to his immediate neighborhood only, but he seeks them all over the world. And as he seeks customers everywhere he will find competitors everywhere. Germany has advanced wonderfully in her trade and manufactures in the last few years, and it is the result of the educational training given to her workmen. Upon the foundation of intelligence and skill imparted by our schools, the founders should build, imparting to their workmen a widened knowledge of the required work, so that men shall not spend their life in a mind-benumbing narrow attention to a single process, but shall have an intelligent conception of the whole business. With men thus trained from some of whose quickened intellects may spring new ideas and new inventions that may save labor and lessen cost and put their owner at the head of the market, the American founder need not for a moment fear the competition of the world.

It is a fact universally recognized that the boy is father to the man; and that if we wish men to be what they ought to be, their training must begin when they are boys. In morals, in patriotism, in industrial habits, and in creative ability, the necessity of training the boys is fully recognized. And if we in America are to have a noble army of intelligent, skillful, and efficient mechanics able to cope with the carefully trained workmen of Germany, we can not do too much to secure the proper training of the boys who are to be the workmen of the future, and employers should avail themselves of every possible facility for training for effective industry the sons of their employes, and this should be done for the two-fold purpose of insuring success for our industrial enterprises in the years to come and of securing for the boys of today who are the coming workers of the future a noble independence born of a consciousness of ability, usefulness, and importance in the great work of national industrial production.

FIRST UNIT OF CHAIN OF PATTERN SHOPS.

Incorporation papers have been issued to the American Pattern & Model Co., of Chicago, with a capital stock of $10,000. It is the purpose of the company to conduct a general wood and metal pattern and model business. Property at 702-704 North Halsted street, Chicago, containing 7,000 square feet, has been leased, where the first has been started of several shops to be established throughout the United States at such points as the trade warrants. Every known modern machine and device for the production of wood and metal patterns has been installed, making this a modern, up-to-date shop. The machines and all individual motor devices are of the latest design and the shop is lighted by electricity.

CANTON SHEET MILL HAS BEGUN OPERATING.

The Canton Sheet Steel Co., Canton, O., manufacturer of pickled, cold-rolled and annealed black and galvanized sheets, put one section of its new mill into operation, Wednesday, Dec. 21. The company plans to have the entire mill running by Jan. 1. W. W. Irwin is president, H. S. Renkert is vice president; J. E. Graham, second vice president; C. A. Irwin, general manager, and T. O. Callahan sales manager.

The International Harvester Co. has announced that its plan for bonus distribution among employes this year includes the division of about $550,000, to be paid in cash and stocks.

BUTLER HONORED

On His Seventieth Birthday—Schwab Is Optimistic.

About 50 men prominent in the iron and steel trade attended a dinner at the Union Club, Cleveland, on Dec. 21, in honor of the seventieth birthday of Joseph G. Butler Jr., of Youngstown. It was fitting honor to a man whose family has been continuously identified with the iron business since the revolution. Mr. Butler's great-grandfather was in the charcoal iron business when the colonies revolted, and the family has never ceased its identity with the premier trade of the United States.

The dinner was distinguished by the prominence of the guests. The leading speaker was Charles M. Schwab, of the Bethlehem Steel Corporation. Mr. Schwab was extremely optimistic in his remarks. He regarded business depression as but temporary and said the United States is bound to expand. Even during the years in which he has been connected with the iron business, which are necessarily few, as Mr. Schwab is still a young man, the production of pig iron has increased from 1,000,000 to 25,000,000 tons per annum. He predicted also that the United States would eventually have a merchant marine commensurate with its importance as an industrial country.

William P. Palmer, president of the American Steel & Wire Co., spoke on the topic, "We Have Been Friends Together in Sunshine and in Shade."

Mr. Butler spoke delightfully in a reminiscent vein. Other speakers were: Samuel Mather, John Stambaugh, Leonard Peckitt, H. Coulby, Robert Bentley, W. A. Rogers, J. A. Campbell and Father Barry, of Youngstown.

Those in Attendance.

W. G. Mather, F. B. Richards, Leonard Peckitt, Samuel Mather, J. G. Butler Jr., James H. Hoyt, Chas. M. Schwab, J. A. Campbell, William A. Rogers, W. P. Palmer, E. W. Oglebay, Harry Coulby, C. D. Dyer, H. H. Brown, W. L. Brown, H. G. Dalton, Robert Bentley, Rev. J. P. Barry, H. H. Stambaugh, John A. Penton, Arthur McGraw, H. A. Butler, John W. Ford, John Stambaugh, Col. J. J. Sullivan, Thomas H. Wilson, D. B. Chambers, E. P. Williams, W. G. Pollock, E. L. Ford, J. C. Wallace, J. J. Hendrickson, George Bartol, C. S. Robinson, James H. Dempsey, A. E. Adams, R. C. Steese, Jay M. Pickands, Richard Garlick, Fayette Brown, B. A. Wallingford Jr., Jos. Frantz, C. K. Hine, C. H. Booth, Geo. D. Wick, J. H. Sheadle, William McLauchlan, Price McKinney, Matthew Andrews.

The American Screw Co., Boston, has declared a dividend of 2½ per cent, payable Dec. 31.

MODERN IMPROVED GRINDING METHODS[1]

Advances in Design and Construction of Grinding Machines Which Have Greatly Increased Their Usefulness

By B. M. W. Hanson.[2]

The grinding machine, as now used, is of comparatively recent origin, within the memory of men now living. The first machines suggestive of modern methods of grinding were made in England and America, but it is in America that they have reached their highest development.

The invention of emery wheels made it possible to make fairly rapid progress with grinding processes. At first very little work was ground which could be machined and filed. The process of grinding was confined to pieces of hardened steel, but after a while it was discovered that unhardened pieces could be machined and finished more accurately and cheaply by grinding than by finish turning and filing.

The grinding machine for cylindrical surfaces was developed to meet all strains and forces due to the cutting power of the shellac emery wheel; but when corundum and carborundum wheels were put in use it was found that the machinery was not heavy enough to resist their cutting power or vibration. Within the last few years grinding machinery has become a formidable competitor of the lathe and milling machine and seems to be quite up to the cutting capacity of the wheels.

The Conditions to be Met.

Designers of grinding machinery have had many problems to solve. Different materials require different speeds and on the modern machine there must be various speeds for the grinding member as well as for the traverse and revolution movement of the work. Machines must be designed with water pumps, and the working parts must be protected from water and from the grit from the wheel. The grinding member usually moves at a high rate of speed and must have carefully designed bearings which will run freely, yet without any back lash, as true surfaces can only be obtained when the work and the reducing member move against each other in fixed positions. Most of these difficulties have been met and further refinements are constantly being made.

The grinding machines now used can be divided into machines for cylindrical grinding and machines for grinding flat surfaces. Cylindrical grinders are well known and have been highly developed by four builders in this country. The surface grinder is best known as a planer type machine, with a wheel grinding on its periphery, and fed across the surface in much the same manner as a tool is fed across the surface in a planer or shaper. Another type is the vertical surface grinder with a cup-shaped wheel working in much the same manner as an end mill on a vertical milling machine.

Automatic Control of Sizing.

In doing work on lathes or milling machines, it is comparatively easy to reproduce several pieces to the same dimensions by adjusting the machine to a size, because the reducing member, which is the turning tool, will resist wear for a considerable length of time without making any difference in the size of the work. With the grinding machinery this is more difficult, since the reducing member is constantly wearing away at a rapid rate. For very close work it is necessary to readjust the machine for every piece to be ground, which requires skill and time.

The devices shown in Fig. 1 are of such construction that they control the size of the work, no matter how much the reducing member wears way. When the work has reached the desired size, which can be predetermined by suitable adjustments, the machine will automatically throw out the feed and new pieces can be put in, one after another, and these will be automatically ground to practically the same diameter, say within one-quarter of a thousandth of an inch.

This result is brought about by controlling the feed of the reducing member electrically. The mechanism of the controlling device is shown in Fig. 2. The lever *A* carries a smooth-pointed diamond which bears against the work *W* at *a* and at its other end is the point *b* for electrical contact. There is a second lever *C* with contact point at *c*, and a contact point *d* is attached to the frame. As the diameter of the work is reduced the long arm of lever *A* drops until point *b* touches the contact point at *c*, which through an electrical connection changes the feed of the wheel and causes it to move against the work at a slower rate. When the work

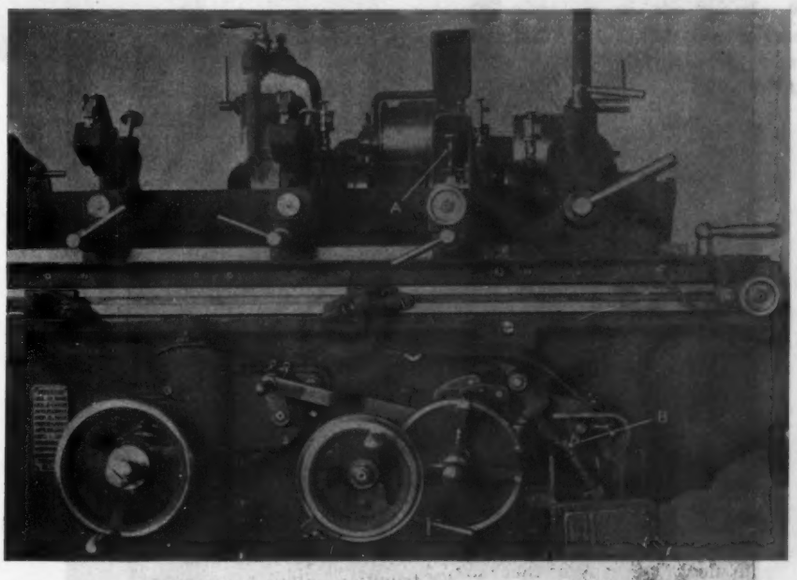


Fig. 1—View Showing Device *A*, and Magnet at *B*, Through Which the Feed is Controlled.

[1]Abstract of a paper read at New York meeting of American Society of Mechanical Engineers, December, 1910.

[2]Hartford, Conn.

has been reduced to size, lever *A* drops still further, carrying with it lever *C*, until an electrical connection

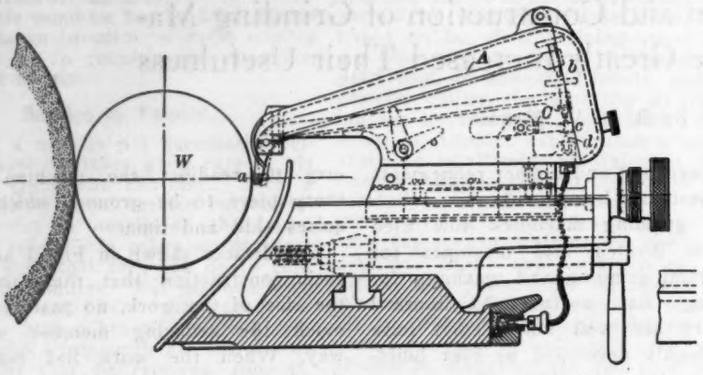


FIG. 2 VIEW SHOWING MECHANISM OF SIZING DEVICE

is established between points *c* and *d* which throw out the feed.

It will easily be seen that an operator can manipulate more than one of these machines and that by their use less skill is required to get uniformity of size. In this design the size of the work is controlled by contact with the work itself, which is the preferable way, but the same results could be obtained by contact with the reducing member. This, however, would be more difficult because of the coarseness of the reducing member and its ability to wear away the contact point faster than does the work.

Another recent device is the back rest, shown in Fig. 3. It has been found necessary to support the work as rigidly as possible throughout its length, but as the work is constantly being reduced in diameter, the back rest must be kept in contact with the work either by hand or automatically, and hand adjustment requires considerable skill. In the device shown it is accomplished automatically, the back rest advancing at exactly the same rate that the diameter of the work is reduced by the wheel; and as it advances, the back rest member is locked solid, making it impossible to spring it by the wheel pressing against it when traveling across.

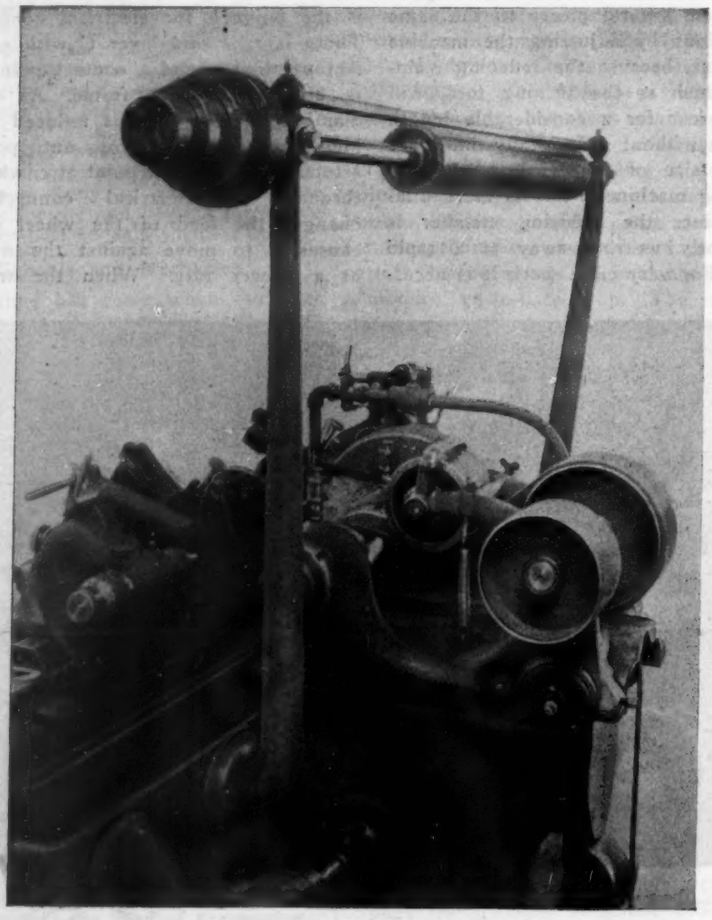


FIG. 3—BACK REST IN PLACE.

This view also shows the overhead drum, which is made an integral part of the machine. The main drive for the machine is by single belt to a short shaft at the base, from which the drives for the wheel and the drum are belted. This arrangement avoids a complicated overhead countershaft and enables the operator to change the speeds and manipulate the various mechanisms with ease.

Grinding Flat Surfaces.

The operation of the back rest will be understood from Fig. 4. The arm *A* which supports the work is held in contact with the work by means of the weighted lever *B*, fulcrumed in the frame against the adjusting screw *D* at point *C* and causes the arm to slide in an upward direction on pin *E*. As lever *B* is depressed a roller *F* travels downward into the V-shaped space formed by the upper surface of lever *B* and the lower surface of the the casting *G*, this roller preventing any upward movement of the lever and consequently any movement of the back rest away from the work.

As said before, surface grinders have usually been made with the wheel grinding on its periphery and, in some instances, it may be necessary to continue to do work on this principle, as grooves and irregular shapes sometimes have to be ground and the thinness of the wheel makes it possible to get into narrow places; but for flat surfaces, the cup-shaped wheel has taken a foremost place in grinding. The wheel covers the whole width of the work at once and water is forced through the center of the spindle, centrifugal force throwing the water outward and compelling it to pass between the work and the wheel. It is astonishing with what rapidity work can be reduced to a flat surface under this process.

Selecting the Wheel.

This method of grinding would never have been successful if it had not been for the advancement in wheel making. The wheel problem in connection with the machine has been most difficult. It has been found very essential to select the right kind of wheel for different classes of work and for different materials. For grinding steel, either hardened or soft, corundum wheels have proved the best

and for grinding cast iron the carborundum wheel has proved the best. The different degrees of hardness must be taken into consideration when the width of the surfaces to be ground varies.

The makers have decided to place on the market a much larger machine of this type than they have made before, shown in Fig. 5. This machine has a table stroke of 6 feet, and can grind a piece 6 feet long and about 25 inches wide. It can also grind circular rings and disc surfaces up to 30 inches in diameter. The wheel has a diameter of 30 inches and the whole machine is driven from a single belt by a 40-horsepower motor. As this machine has just recently been built, its capability is not fully known, but for work that has already been tried it shows very encouraging results.

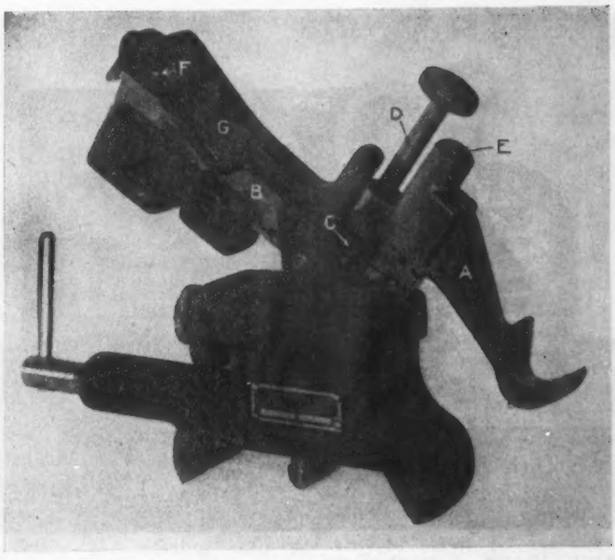


FIG. 4—BACK REST DESIGNED TO AUTOMATICALLY FOLLOW UP REDUCED SIZE OF WORK.

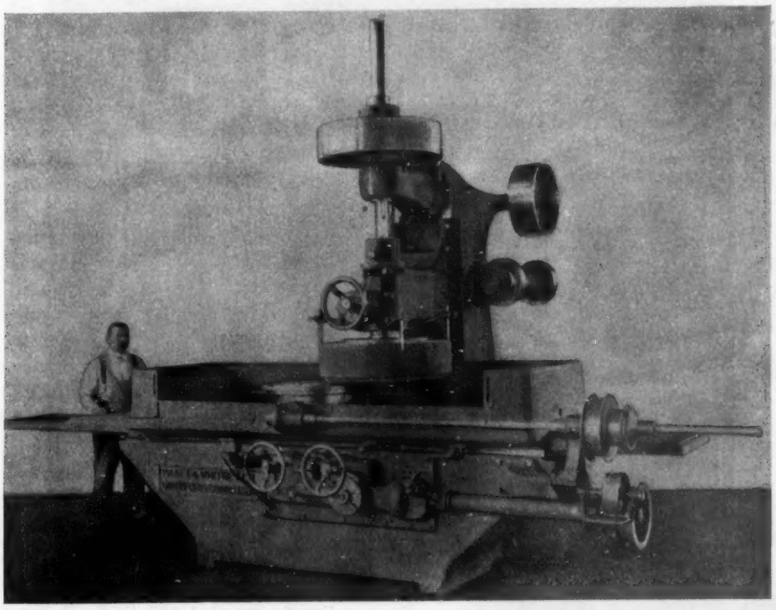


FIG. 5—LARGE SURFACE GRINDER, 25 x 60-INCH, WITH 30-INCH WHEEL.

For such work as grinding guide bars, slide valves and link motions for locomotives, large stamping dies, facing automobile cylinders and automobile engine frames, I believe it will show its superiority over any other method by several hundred per cent. In one of the trials a surface of cast iron, 6 feet long and 20 inches wide, was reduced in thickness 0.01 inch in five minutes, leaving an excellent finish and an exact flatness. In fact, when tested, no point in the surface showed cut of truth more than 0.0005 inch. In grinding steel this type of surface grinder produces chips that look very much like metallic wool, which seems to indicate that when a cupped wheel passes over the work the chips are made by the outer edge of the wheel in the same manner as chips are produced by the outer edge of an end milling cutter. The large surface in contact with the work simply smooths the surface.

The table on these machines is provided with different feeds. It is difficult to make an exact rule as to what feeds to use for different materials, but the operator can determine this by running the machine a few minutes. The difficulty lies in the fact that wheels supposed to be made of the same specifications vary considerably and consequently the feed has to be regulated not only to suit the material being ground but also to suit the cutting ability of the wheel to be used. At the present time it is safe to say that grinding machinery is fully developed to the cutting capacity of the wheels and there will probably not be any essential changes until the grinding wheels have reached a higher development.

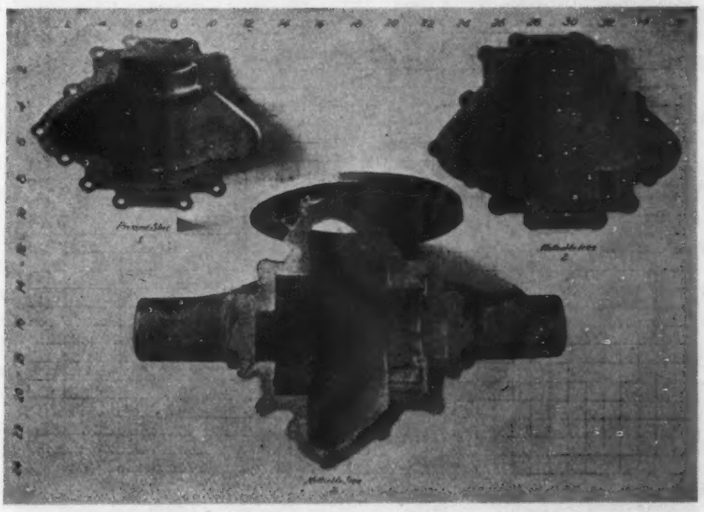


FIG. 6—SAMPLES OF GRINDING: No. 1, PRESSED STEEL, 15 PER HOUR; No. 2, MALLEABLE IRON, 15 PER HOUR; No. 3, MALLEABLE IRON, 12 PER HOUR.

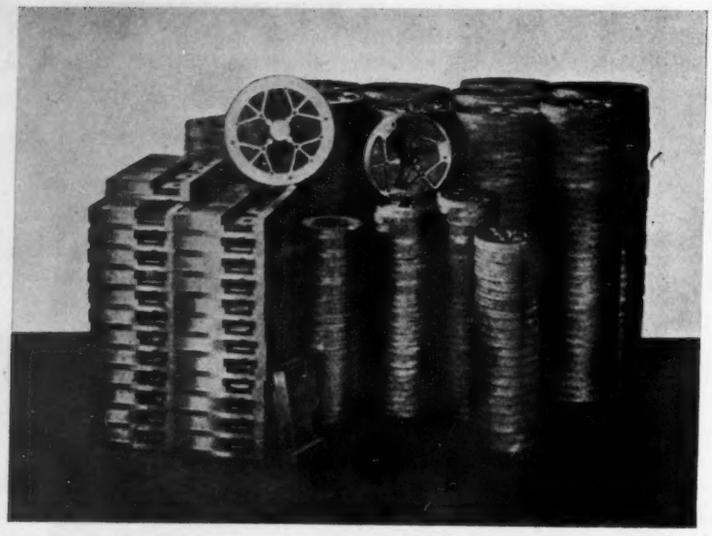


FIG. 7—CHUCK PLATES, GROUND BOTH SIDES: 6-INCH, 20 PER HOUR; 9-INCH, 15 PER HOUR; 12-INCH, 10 PER HOUR; VISES, GROUND ON TWO EDGES, TOP AND ONE END, 20 PER HOUR.

In Figs. 6 to 9 several photographs are shown of work which has been ground on vertical cupped-wheel machines. In some instances, such as in the production of small gun parts, like hammers and triggers, the work has been done from 15 to 20 times faster than it can be milled and it has a smoother and more accurate surface. This is especially true where the surfaces are not too wide.

To give an idea of the capacity of a grinding machine having a cupped wheel for grinding flat surfaces, compared with a grinding machine having a wheel grinding on its periphery and working on the principle of a planer, it is worth while to note the following:

The traversing speed of the work or the work table can be assumed to be the same. If a piece is 6 inches long and 3 inches wide, the machine grinding on its periphery will take about 48 strokes to cover the surface, assuming 1/16 inch feed for each stroke. The cupped-wheel machine will do the same amount of work with one stroke or in about 1/24 the time. These proportions are essentially true on hardened steel or on any kind of work where a nice finish is required.

New Electric Furnaces at Domnarfvet, Sweden

The experimental electric furnace for the smelting of iron, which has been in operation for some time at the Domnarfvet iron works, and which was described in THE IRON TRADE REVIEW, Aug. 11, 1909, has, it is reported, now been pulled down in order to make room for new electric furnaces. To begin with, only one new electric furnace will be built at Domnarfvet, but the plans comprise the building of 10 electric furnaces, each of which will require 4,000 horsepower, while the one now being built at the Trollhaetten falls is only intended for 2,500 horsepower. The Bullerfors power station, which, with high water, can only yield a maximum of 24,000 horsepower, will, consequently, not be sufficient when all the furnaces have been built, and plans are therefore under discussion for building an additional power station at Torshnfond, above the Kvarnsveden paper mills.

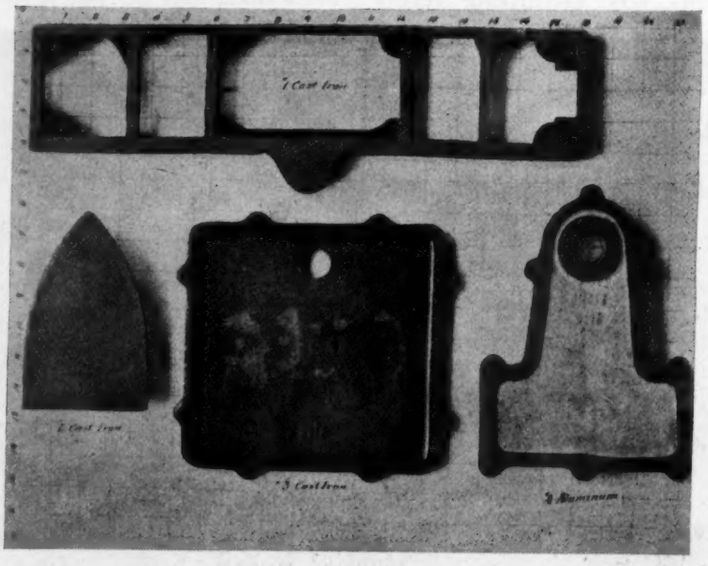


FIG. 8—NO. 1, CAST IRON, 15 TO 20 PER HOUR; NO. 2, CAST IRON, 60 PER HOUR; NO. 3, CAST IRON, 25 PER HOUR; NO. 4, ALUMINUM, 30 PER HOUR.

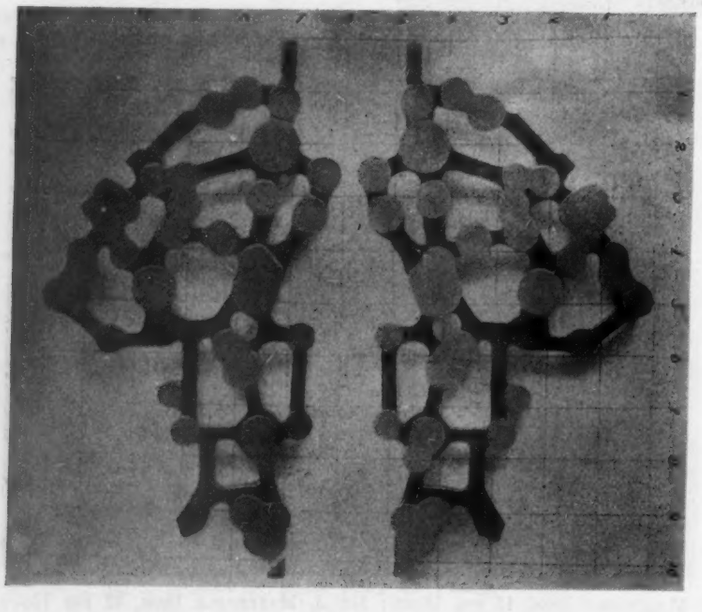


FIG. 9—ADDING MACHINE FRAME, CAST IRON, 15 PER HOUR.

DETERMINING MOISTURE IN AIR BLAST

Description of a Simple Method of Ascertaining the Humidity of the Air Entering the Stack

By Clarence P. Linville.[1]

Since it has been generally recognized that the moisture which is present in the air has a profound influence on blast furnace operation, many blast furnace managers are investigating the moisture conditions at their plants and studying its effects upon their furnace practice.

It is the purpose of this article to point out some of the common errors which are met with in making these determinations and to suggest a proper method of conducting psychrometric observations at blast furnaces.

The air that is blown into the blast furnace through the tuyeres will almost always be found to contain a larger amount of moisture per cubic foot than is shown in the outside air at the plant, or at the local weather observatories. This is due to the fact that the furnace is usually located in the vinicity of water, on low lying ground, to the considerable amount of exhaust steam from the plant itself, to evaporation from water cooling plants, and various other causes which tend to increase the humidity in the neighborhood of the blowing engines.

It has been also shown that the air in its passage through the blowing engines usually takes up some moisture due to leakages of steam.* It is thus evident that, in order that moisture determinations may be of use in making an accurate study of blast furnace operation, they should be made on air taken from the cold blast main between the blowing engines and the stoves. It is not sufficient to make those determinations in the blowing engine room, even though they be made in the air at the intakes to the blowing tubs.

Method of Making Test.

Some methods of making moisture determinations in the air are: 1. By wet and dry bulb thermometers, or psychrometers; 2. by absorption of the moisture from known volumes of air, and weighing the amount absorbed; (3) by hair hygrometers.

Of these the first is the only one that is practicable for general use; the absorption method is perhaps somewhat more accurate but is very troublesome, and the third, while it may be used as a recording method, does not give very dependable results.

The wet and dry bulb method serves the purpose very well and gives accurate results with but little trouble. Mercury thermometers with Fahrenheit scale are generally used, though recently electric resistance thermometers are coming into use, and since these can be made recording, it would be possible to obtain a continuous record of moisture conditions. Using mercury thermometers we have to be satisfied with taking observations at intervals, say every hour.

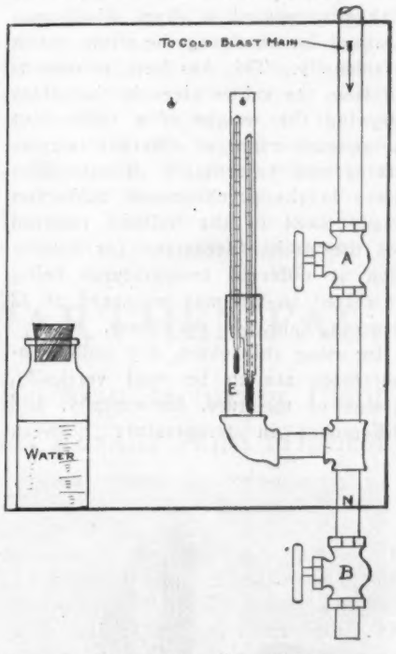


Fig. 1—Apparatus For Determining Moisture in Furnace Blast.

The following method of using the wet and dry bulb psychrometer has been used with very good results.

A small pipe is connected with the cold blast main, at a point between the blowing engines and the hot blast stoves. This is led to a convenient location and is connected up as shown in Fig. 1. The valve *A* controls the velocity of the air and its volume. The nipple *N* and valve *B* serve as a trap to collect any oil which may be carried along with the blast. The larger pipe *E* is made of such a size that it will allow the wet and dry bulbs of a psychrometer to be inserted to a depth of 3 or 4 inches. The best results will be obtained by using a pipe flattened so that there will be a minimum of free space surrounding the thermometer bulbs, thus creating a high velocity in the escaping air with a comparatively small volume. A hook placed at the proper height will allow the psychrometer to be hung free during the taking of observations, and another placed nearby can be used for supporting the instrument between observations. This part of the apparatus should preferably be enclosed in a small locker provided with an electric light for convenience in making observations. In making a determination the valve *A* is opened so that the air velocity, when passing around the wet bulb, is at least 10 feet per second. This is necessary to insure that the evaporation from the wet bulb does not increase the humidity of the air surrounding it, and thus give incorrect readings of temperature drop due to evaporation. The air should be allowed to escape for several minutes to allow air standing in the pipes to be expelled, and thus give determination on air being actually blown at the time of the observation. In fact, even should the valve be allowed to remain open the amount of blast lost would be negligible. Since the air is somewhat heated by the compression in the blowing engines it will be found that the dry bulb readings may be high, often over 100 degrees Fahr. This is not desirable and may be avoided in connecting up the apparatus by making the pipe from the cold blast main of sufficient length to allow of thorough cooling.

Precautions to be Observed.

The psychrometer should be removed from the pipe between observations, which will prevent the cloth covering of the wet bulb from becoming saturated with oil. If, as occasionally happens, the cloth becomes fouled and dirty a new one should be used. For good results it is essen-

[1]State College, Pennsylvania.

Metallurgical and Chemical Engineering, page 393, July, 1910.

tial that the cloth covering of the wet bulb should be clean, and especially should it be free from oil. Before each determination the cloth is carefully and thoroughly moistened with clean water, using precautions to keep the other bulb perfectly dry.

In making an observation place the instrument as indicated in the diagram, the bulbs being in the stream of air passing out of the pipe *E*; allow to remain until the minimum reading is obtained on the wet bulb,

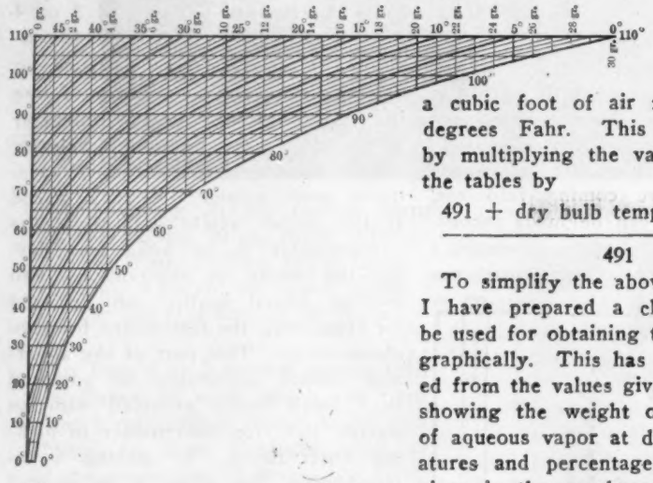


FIG. 2—CHART FOR MAKING PSYCHROMETRIC DETERMINATIONS WITH DRY AND WET BULBS.

Horizontal Lines = Dry Bulb Temperatures in Degrees Fahr.
Vertical Lines = Grains of Moisture per Cubic Foot of Air at Standard Conditions.
Curves = Difference between Wet and Dry Bulb Thermometer Readings.

which will usually require at least a minute, then note both wet and dry bulb temperatures. As a general thing it is not necessary to take a barometer reading, and results of sufficient accuracy are obtained by assuming a barometric pressure of 30 inches of mercury. The most accurate results, however, are corrected for pressure.

With the above determined data, the moisture condition of the air may be determined by reference to a set of psychrometric tables, such as may be obtained from the United States weather bureau.**

The Use of the Chart.

Two operations are necessary. First. By reference to tables showing relative humidity we find the percentage of saturation corresponding to the wet and dry bulb reading, and next, having this value, to a second table which gives the weight in grains per cubic feet of the amount of moisture in saturated air at the different dry bulb temperatures. Knowing the percentage of saturation the actual weight of moisture may be calculated. The result thus obtained gives the amount of moisture expressed in grains per cubic foot of air, measured at the temperature of the dry bulb.

For studying the effects of moisture on combustion phenomena it is proper to convert this volume at standard conditions, or, what amounts to the same thing, to correct the grains of moisture to the amount in a cubic foot of air measured at 32 degrees Fahr. This may be done by multiplying the value found from the tables by

$$\frac{491 + \text{dry bulb temperature} - 32}{491}$$

To simplify the above computations I have prepared a chart which can be used for obtaining the above result graphically. This has been constructed from the values given in the tables showing the weight of a cubic foot of aqueous vapor at different temperatures and percentages of saturation given in the psychrometric tables on pages 83-84 of the bulletin referred to, the grains necessary for saturation at different temperatures being corrected to volumes measured at 32 degrees Fahr., in each case.

In using this chart, dry bulb temperatures are to be read vertically, grains of moisture, horizontally, and differences in temperature between wet and dry bulbs, to be read from right to left, on the slanting curved lines.

The intersections of the dry bulb temperature lines with the "difference" lines give grains of moisture per cubic foot, measured at standard temperature and 30 inches of mercury.

The following is given as an example of the use of this chart: Dry bulb reading, 92 degrees; wet bulb reading, 81 degrees; difference, 11 degrees; barometer (assumed) 30 inches.

From the psychrometric tables* we find the relative humidity to be equal to 63 per cent, and from Table XII† we find the weight corresponding to this relative humidity to be 9.883 grains.

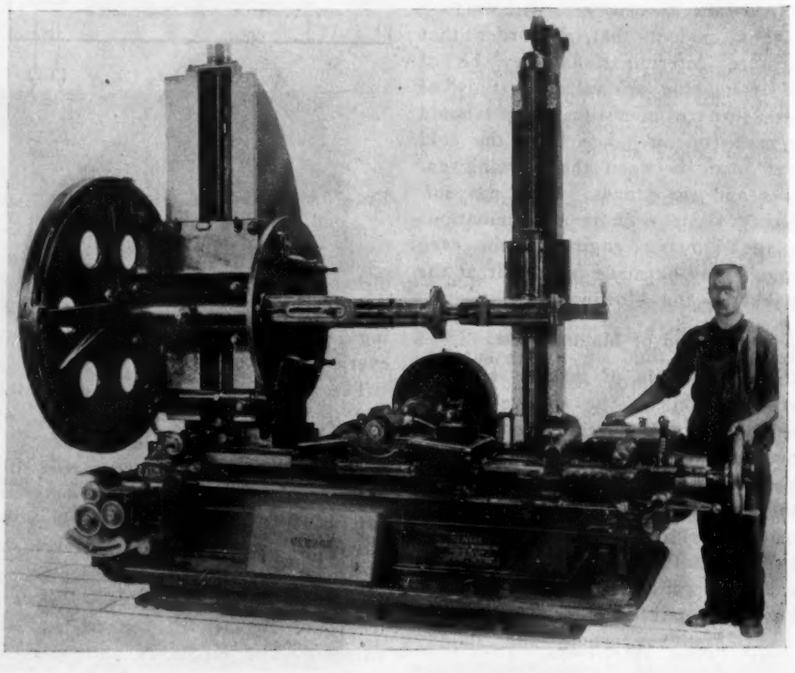
To reduce this value to standard temperature conditions we multiply

$$9.883 \times 551/491 = 11.09 \text{ grains.}$$

The above result is obtained at a glance by referring to the above given chart, by following the temperature line for 93 degrees across to the intersection with the difference line 11 degrees and reading down the vertical humidity line corresponding with the intersection. The humidity being found to be 11 grains.

Large Gear Cutting Machine With New Features

The accompanying illustrations show an automatic spur gear cutting machine, manufactured by the Newark Gear Cutting Machine Co., Newark, N. J., for heavy spur gears. The machine



THE NEWARK GEAR CUTTING MACHINE.

**Bulletin W. B., No. 235, United States Department of Agriculture. Price, 10 cents.

*Weather Bureau Bulletin No. 235, p. 60.
†Weather Bureau Bulletin No. 235, p. 84.

has a capacity for gears up to 84 inches diameter, 24 inches face, and 6 inches circular pitch. The machine is the most powerful and largest size machine of the horizontal type made by this company, and the photograph gives a good idea of the general construction and appearance.

The machine is driven by a single speed pulley running at 300 revolutions per minute. The cutter spindle is provided with a taper hole to receive cutter arbors, which are drawn into and forced out of the spindle, by means of a draw-bolt. The spindle and arbor are heavy enough to carry a gang of finishing cutters, or a gang of finishing and roughing cutters side by side on the arbor. The spindle is driven by spur gear and the various speed changes are obtained by means of change gears placed as near the last driver as possible.

The feed changes of the cutter carriage are obtained in a similar manner, by means of change gears; but the rates of cutter speed and carriage feed are independent of each other, so that one may be changed without affecting the other. The carriage quick return is constant and not affected by the feed or speed of the cutter. The carriage feed screw and its thrust collars are arranged so that the screw is not subjected to compression strains either when feeding or returning the carriage, which assists in securing a smooth, uniform feed with freedom from vibration.

The indexing or dividing mechanism comprises a large master wheel, and positive actuating mechanism. The master is a worm wheel, generated in place on each machine and receives its movement through the positive indexing mechanism, which is of a simple clutch type, requiring no adjustment. The various divisions for different numbers of teeth are obtained by means of change gears, which provide for cutting all numbers of teeth up to 450 except prime numbers above 100. A considerable range of higher numbers can also be cut. Any unusual number can be cut by means of an extra change gear.

A safety device in connection with the positive indexing mechanism prevents the carriage from feeding until the division has been correctly completed. This is important when the value of large and expensive gears is considered. Another safety device also prevents the machine from dividing when an obstruction on the gear blank, such as a lug or flange, would collide with the rim support, and otherwise injure the gear or the machine. This mechanism is entirely automatic, does not require any setting or adjustment, and operates regardless of the size of the gear or the number of teeth being cut. It also, through its interlocking feature, prevents the operator from engaging the feed mechanism, while the machine is dividing.

The work spindle is provided with a taper hole, to receive work arbors and a draw bolt to draw in and force out arbors positively. The head is provided with screw and micrometer dial, graduated to read to thousands of an inch. Quick adjustment of the head by power, either up or down, is provided for.

In a large machine, an important feature is the convenience with which it can be set up for various jobs. The operating levers are placed so that they are instantly under the control of the operator. The feed lever controls the engagement of the power feed to the cutter carriage and the index lever is used to trip the indexing mechanism, or to set the machine to rotate the blank continuously. The feed can be set so that the carriage will feed and return without indexing, which is useful when setting up. The carriage hand wheel is self-disengaging, so that it does not revolve when the power feed is engaged.

An oil pump is supplied for furnishing lubricant, when cutting steel.

EFFICIENT DEPARTMENTAL ARRANGEMENT

Planning a Manufacturing Plant to Secure Maximum Results With Highest Economy

By Oscar E. Perrigo.*

In the consideration of any plan with which the engineer has to do there must always be a distinct and well defined object to be accomplished. If it be the designing of a machine, the machine when constructed and in operation must accomplish a certain result, perform a certain operation or series of operations. If it be to design a manufacturing building, the building must also accomplish a certain definite purpose, as the housing of certain machines or sets of machines, which in turn are required to produce certain output by performing the necessary operations in the proper sequence and with due regard to efficiency and economy.

In every field of designing the ultimate object to be attained is the first subject to be considered, and its attainment in an efficient and economical manner is the problem continually to be kept in mind, considered, studied and planned for. To a very considerable extent the end must justify the means.

Viewed from this standpoint the designing of manufacturing buildings, their division into departments and the proper arrangement of these departments with relation to each other for the highest efficiency, combined with reasonable economy, will depend to a very large extent upon:

First, the nature of the product to be turned out.

Second, the method of handling and machining the component parts of the product.

Third, the kind and number of the machines required in the machining operations.

Therefore, preliminary to the actual designing of the building; or in the case of utilizing existing buildings, before attempting a division and arrangement of departments, we should proceed in a systematic manner as follows:

First. To examine carefully the product which is to compose the output.

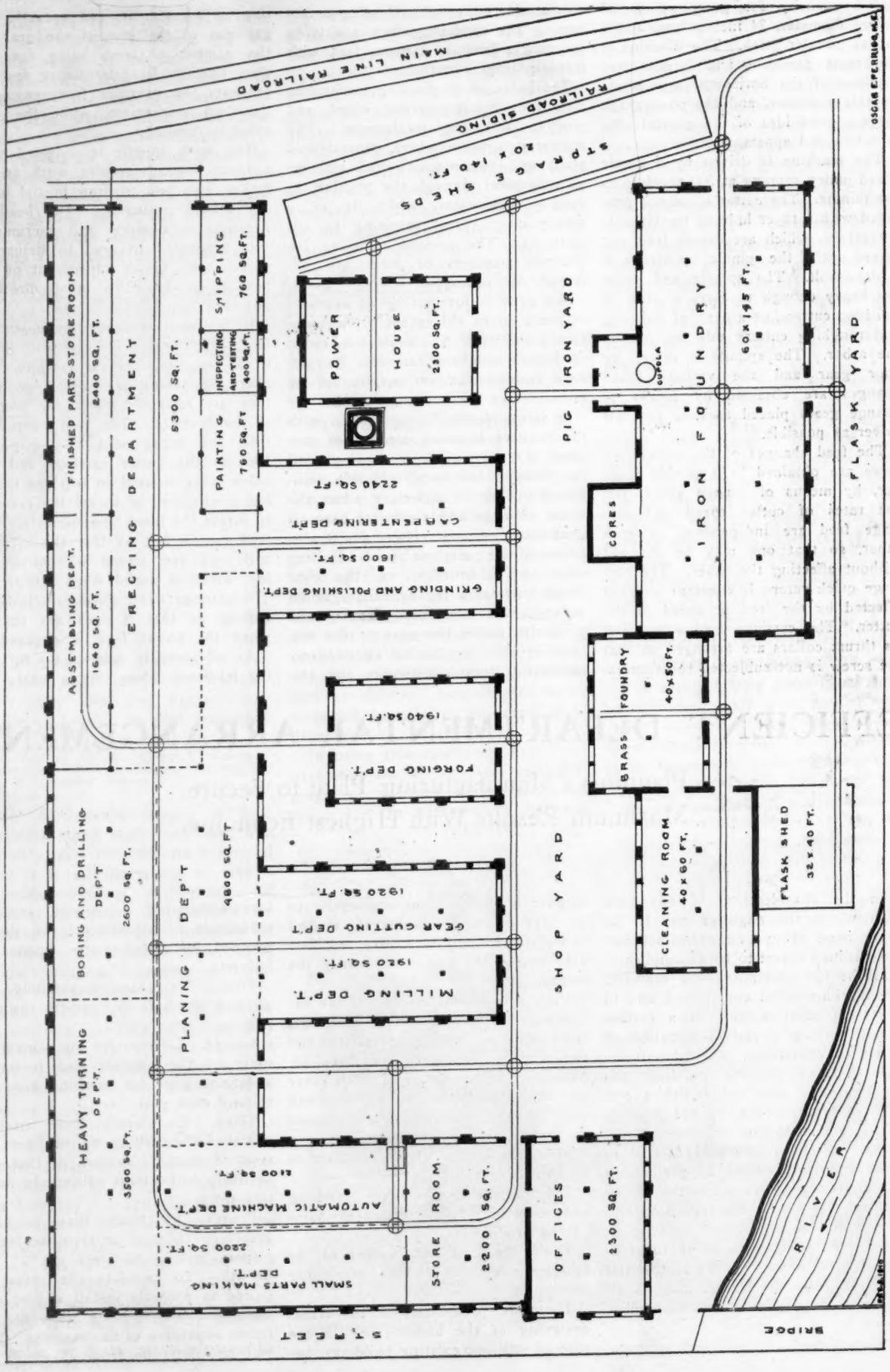
Second. To consider the component parts of the product and formulate a definite plan for handling and machining each part.

Third. To classify these machine operations according to the kind or type of machine needed, or that will be likely to be most efficient in doing this work.

Fourth. To classify these machines according to kind or type, as lathes, planers, milling machines, etc.

Fifth. To calculate the space required to properly install and operate these machines, making allowance for future expansion of the business. This will ordinarily be from 25 to 50 per

*Boston, Mass.



PLAN OF MANUFACTURING PLANT SUGGESTED AS TYPICAL OF GOOD ARRANGEMENT.

cent, but in many cases 100 per cent or more, according to the nature of the product, the prospects of its increased sale, and for the addition of similar lines of manufacture.

It will be realized that the subject presents numerous complicated problems, requiring careful consideration and the judgment acquired only by ample practical experience, observation and natural ability in this line of investigation, and in the subsequent planning which is required.

In this article we shall assume that the preliminary work has been completed and the equipment of manufacturing machines determined upon. Before proceeding to a description of the arrangement of departments of a plant there are several requirements, which experience has demonstrated to be necessary, which should be noted.

First. The relation of departments must be such that in routing the work from the receiving point to the shipping point it will pass in as direct a line as possible, with few or no retrograde movements, as these have a tendency not only to retard the work, but to congest the traffic over shop and yard tracks, causing delays; and to cause a considerable increase in the cost of transportation.

Second. The routing of material will be largely governed by the location of the principal receiving and shipping points.

Third. The strictly manufacturing departments should be so arranged as to conform to the natural sequence of machine operations necessary upon the product.

Fourth. The receiving point should be selected with a view to its accessibility from the foundry and forge shop, when the plant includes these departments, otherwise as to its accessibility from existing or proposed transportation lines. The effect of its location upon that of the several manufacturing departments must also be considered.

Fifth. In a factory consisting of several floors the receiving and shipping points will necessarily be on the first floor. Such a condition requires secondary receiving and shipping points on each floor. Communication between the several floors being by elevator, this will become both the receiving and shipping point, so far as the individual floor is concerned. Therefore, the manufacturing departments should be arranged in groups performing related operations, or operations upon the same material or class of material, on each floor.

Sixth. Mechanical and structural conditions require that in a building of more than one floor, heavy machines requiring special foundations must be placed on the ground floor, while the lighter machines are placed on the second or higher floors according to their weight.

Seventh. If the plant is composed of buildings of one floor only, and having secondary buildings or wings attached to a main building, they should be so arranged that the ends shall join the main building. If departments are to be arranged in existing buildings, it is sometimes possible to move one or more buildings, or to build such connecting structures as may be needed to permit the adoption of an economical and efficient plan.

Eighth. The foundry and the buildings containing the manufacturing machinery should be separated by an open yard in order to prevent foundry dust and dirt from being blown into the machine departments and injuring the machinery.

Ninth. The forging department, particularly when heavy hammers or drops are used, should be separated from the machine departments and the power house so as to minimize the injury to machine foundations from the shocks of forging and from the foundry, as these shocks are liable to injure the sand molds.

Tenth. Whatever arrangement of departments may be adopted those doing nearly related classes of work should join each other, when possible, without disarranging the other requirements of the plan.

Arrangement of Departments.

The usual departments of a complete manufacturing plant building machinery is as follows, placed as nearly as may be in order of their relation to the work of manufacturing.

Preliminary work: 1. Mechanical engineering (drafting room); 2. pattern making; 3. tool making; 4. experimental work; 5. power plant.

Providing material: 6. Receiving and storing; 7. iron and brass foundries; 8. forge shop and cutting-off room.

Machining operations: 9. Planing, shaping and slotting; 10. boring and drilling; 11. heavy turning; 12. milling; 13. gear cutting; 14. automatic machine work; 15. small parts making light turning and fitting; 16. grinding and polishing; 17. finished parts store room; 18. inspecting and testing.

Erecting: 19. Assembling, groups of related parts; 20. erecting.

Miscellaneous: 21. Painting; 22. carpentering; 23. shipping; 24. yard gang.

While only a portion of these departments enter into the consideration of the matter of relative arrangement, the entire list is given as of interest in the complete organization of the plant. It is sometimes the case that two or more of the departments may be consolidated and operated by one foreman, particularly in a plant of small or medium capacity. For instance: the milling and gear cutting may become one department where the gear cutting work is not of large volume. Automatic machine work and the making and fitting of small parts, particularly cylindrical parts, may also be included in one department.

The selection of machines for each department will, of course, depend to a great extent upon the line of work composing the product, nevertheless it may be of interest to give a list of machines as made up for a typical plant building a series of machines of medium weight, say from one to two tons. The list, divided by departments in accordance with the above classification, is as follows:

Pattern shop equipment.

Pattern lathe, 30-inch x 16-feet, with overhanging face plate and floor rest.
Speed lathe, 15-inch x 6 feet.
Face plate lathe, 6 foot swing.
Combination circular saw.
Rip saw.
Cutting-off saw.
Surfacing planer.
Jointer ("buzz" planer).
Band saw.
Core box machine.
Segment press.
Large trimmer.
Cast iron surface plate.
Emery grinder.

Tool room equipment.

One 24-inch x 10 foot engine lathe.
One 20-inch x 10-foot engine lathe.
Two 18-inch x 8-foot tool room lathes.
One 18-inch x 6-foot tool room lathe.
One 12-inch x 6-foot speed lathe.
One 24-inch x 5-foot planer.
One Universal milling machine.
One index milling machine.
One 10-inch shaper.
One sensitive drill.
One 25-inch upright drill.
One 6 x 18-inch surface grinder.
One 4 x 30-inch cylindrical grinder.
One disc grinder.
Three tool grinders.
Two twist drill grinders.
One large surface plate.
One small surface plate.

Experimental room equipment.

One 24-inch x 12-foot engine lathe.
One 21-inch x 10-foot engine lathe.
One 18-inch x 6-foot engine lathe.
One speed lathe.
One 28-inch x 6-foot planer.
One 10-inch shaper.
One universal milling machine.
One index milling machine.
One 20-inch upright drill.
One tool grinder.

Planing department equipment.

One 60-inch x 25-foot planer.
One 40-inch x 20-foot planer.
One 40-inch x 16-foot planer.
Four 36-inch x 12-foot planers.
Four 30-inch x 8-foot planers.
One 16-inch shaper.
Two 20-inch shapers.
One 24-inch shaper.
One 10-inch slotter.
One 20-inch slotter.

Heavy turning department equipment.

One 60-inch x 25-foot engine lathe.
Two 50-inch x 20-foot engine lathes.
Two 36-inch x 16-foot engine lathes.
Four 28-inch x 14-foot engine lathes.
Six 24-inch x 12-foot engine lathes.
One 24-inch x 28-foot engine lathe.

Two 24-inch rapid reduction lathes.
Two 24-inch heavy turret lathes.
One 36-inch heavy turret lathe.
Two 24-inch vertical chucking machines.
One cone-turning machine.
One pulley turning machine.

Boring and drilling department equipment.

One 6-foot vertical boring machine.
One 8-foot vertical boring machine.
One 6-foot radial drill.
One 8-foot radial drill.
One 48-inch horizontal boring machine.
One 60-inch horizontal boring machine.
One gang drill.
Two 20-inch upright drills.
Two 25-inch upright drills.
Two 40-inch upright drills.

Milling department equipment.

Four vertical milling machines.
Two universal milling machines.
Six plain (Lincoln) milling machines.
One 36-inch x 6-foot surface milling machine.
One 18-inch x 6-foot engine lathe.
One cutter grinder.

Gear cutting department equipment.

Three 24-inch spur gear cutters.
One 48-inch spur gear cutter.
One 60-inch spur gear cutter.
Two 24-inch bevel gear cutters.
One gear planer.
One gear shaper.
Two rack cutters.
One hobbing machine.
One 18-inch x 6-foot engine lathe.
One cutter grinder.

Automatic machine department equipment.

Two large automatic screw machines.
Two small automatic screw machines.
Four hand turret machines.
One 18-inch x 6-foot engine lathe.
One emery grinder.
Note.—Hand machines are placed in this department because of a similarity of work.

Small parts making department equipment.

Four 20-inch x 10-foot engine lathes.
One 20-inch x 18-foot engine lathe.
Four 18-inch x 6-foot engine lathes.
One 20-inch x 8-foot rapid reduction lathe.
Two Lo-swing lathes.
One 20-inch upright drill.
One sensitive drill.

Grinding and polishing department equipment.

One 10 x 72-inch cylindrical grinder.
One 10 x 48-inch cylindrical grinder.
Four 4 x 30-inch cylindrical grinders.
One 14 x 40-inch surface grinder.
One 5 x 18-inch surface grinder.
Two 24-inch disc grinders.
Two 16-inch polishing heads.
Two 12-inch buffers.
One strap polisher.
Two 10-inch x 6-foot speed lathes.

This list provides a sufficient number of types of machines in all departments and a proper number of those of each type for the work as originally formulated. As the work increases more machines of certain regular types are expected to be needed, and in the laying out of the floor space ample provision for this purpose should be made.

The general plan of the building comprising the manufacturing plant in question is shown in the accompanying engraving. It will be seen that the available plot of ground is not sufficient for the erection of buildings of suitable dimensions and yet leave the proper proportion of space for yards. However, the space has been utilized to the best advantage.

The front building, on the street, is of brick, 55 feet wide, 200 feet long, with three floors. At right angles to this is the main manufacturing building, 70 feet wide, 300 feet long, also of brick and of one floor only. Joining this at right angles are two wings each 50 feet wide and 80 feet long. These are of brick and of one floor only. Midway between these, but not attached to the main building, is the forge shop, while to the rear of the second wing is the power house, also detached from the main building.

On the opposite side of a narrow yard are the foundry buildings, consisting of iron foundry, brass foundry, cleaning room and flask shed, arranged as shown.

At the rear is a railroad siding from a near-by main line, providing good facilities for receiving materials and supplies, fuel, etc., and for shipping the product. Along this siding are located storage sheds for engine and foundry coal, coke, sand and similar foundry material.

A very complete system of shop and yard transportation affords facilities for passing materials and work in progress from one department to another. In the main building a traveling crane covers the central portion, runs the entire length of the floor, and out over the railroad track at the rear; while machines outside of the area covered by it are served by overhead trolleys, jib cranes and hoists, as may be needed.

Providing for Expansion.

The formulation of a plan and the arrangement of departments with relation to each other began with calculations of the space required by each size and type of machine. This calculation is made of the space actually occupied by the machine and a sufficient space around it for the convenience of the operator and the placing of the work in progress. When this calculation is made for all the machines of a department the arrangement of the machines is laid out, a proper allowance being made for transportation facilities. To this space is added the percentage that has been determined for future expansion by the purchase and installation of new machines. The required area of each department having been thus determined the location of the departments may be proceeded with.

We begin with the front building. On the first floor of the end near the river are the offices. On the second floor is the engineering department, including the drafting room, estimating, records and similar work. On the third floor is located the blue printing and photographing rooms and store rooms for office supplies.

Next to the offices, on the first floor, is the general store room, while the remainder of this floor is devoted to manufacturing purposes. On the second floor over the store room is the toolmakers' department, which occupies a space about 50 per cent larger than the former. The remainder of the floor is occupied by the pattern shop. On the third floor the experimental room occupies the same space as that devoted to the store room, while the remainder of the floor is used for a pattern storage room.

Handling Material.

We now consider the strictly manufacturing departments. To arrange these with proper relation to each other we must first determine the receiving point. The fact that a railroad track is brought to the rear end of the main building determines the location of the shipping point. Manifestly, if we are to avoid the retrograde movement of work in progress as much as possible, the receiving point must be located at or near the end of the plant opposite to the shipping point. This will place it near the junction of the front and the main building. This is readily accessible for castings from the foundry, coming in over the yard track from the cleaning room; from the forge shop by the track passing the yard door of this building, or directly into the main building; and from the store room by the yard track or by the shop track through the center of the front and the main building.

The location of the receiving point usually determines the position of the initial departments of planing and heavy turning. In this case the planing department is so placed as to be first approached as material arrives from the foundry, while opposite is the heavy turning and boring and drilling departments. These three departments are very closely related from the nature of the parts which they habitually handle.

In the front building are the small parts making and automatic machine departments, both of which draw much of their material from the general store room, forwarding their products to the finished parts store room, or to the assembling room, located next to the boring and drilling department. The work of these departments which they do not complete, such as gear blanks and cylindrical parts which are finished by grinding, must be diverted from their direct route to the assembling department, and sent respectively to the gear cut-

ting and the grinding and polishing departments, located in the wing buildings. However, this represents retrograde movements of but a hundred feet or so and is therefore, not particularly important.

Castings to be milled are sent directly to the milling department, located in the first wing, from which they usually go to the boring and drilling department. Occasionally, work may come from the small parts making or planing departments which have to be milled, but the volume of such work is not large or important.

The forging department is directly connected with both the shop and the yard and its product is readily distributed wherever required. The grinding and polishing department, located in the second wing building, sends most of its product directly to the assembling department, or the finished parts store room located next to it.

Locating the Erecting Floor.

There is always a question as to the relative location of the assembling department and the finished parts store room. This depends almost entirely upon the methods of handling the work. In some plants small parts are sent at once to the assembling department and after being assembled into groups are sent to the finished parts store room, while in others small work must go first to the finished parts store room, and from there be issued to the assembling department, from which the assembled groups of parts are afterwards returned. In these, as in many similar matters the simple methods are the better, more efficient and economical.

The erecting department occupies the center of the main building for a distance of 180 feet and is served by both the traveling crane and the shop track, either of which may be used to bring the larger and heavier parts from the front end of the shop. The carpentering department in the second wing building is convenient to the erecting floor, where the products are prepared for shipment. This and the making of foundry flasks comprise a large portion of its work.

The painting department is comparatively small as the most of the painting is done on the erecting floor. Therefore, the room shown is principally used for storing paint materials and for doing quite small work.

The inspecting and testing departments require a room only large enough to provide a safe place for inspectors' tools and gages and desks for the use of the inspectors, whose work may be anywhere in the plant where work is in progress. The testing is done in the erecting department.

The shipping department is at the extreme rear of the main building and is large enough to serve as the shipper's regular office, so as to keep him near the work he is to handle.

Little has been said as to the details of the foundry work, this being considered as a supply department for furnishing material for the strictly manufacturing departments and a subject for separate treatment.

From the foregoing it will be seen that the relative arrangement of departments is such that the routing of the work becomes at once direct and economical; that there is no trouble from congestion of cars and consequent blockades of the transportation system and that all these movements may be arranged in a regular routine requiring but little supervision.

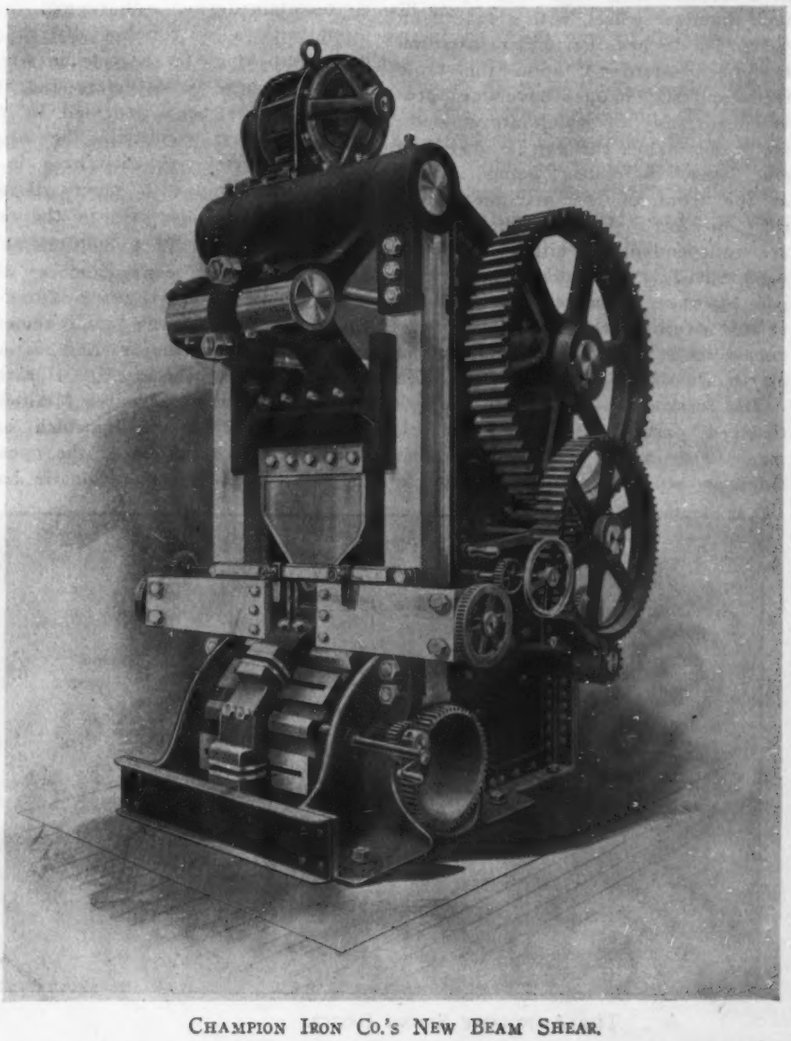
The buildings are so arranged as to give plenty of light and at the same time to be economically warmed and ventilated. The plan affords a good example of a modern and efficient manufacturing plant arranged in compact form to suit the limits of a small building site.

A Novel Beam Shear

What will be recognized as something of a new departure in the line of a beam shear is shown in the accompanying halftone, which represents a machine developed by the Champion Iron Co., Kenton, O., for use in its own shops.

Mechanically considered, the design is extremely satisfying, particularly in respect of the straight-line resistance to strain.

The revolving octagonal holster provides for working a number of shapes of section and, as will be noted, the lower shear blocks are removable, so that the number of shapes dealt with may be increased to any extent desired. The horizontal guides may be adjusted to any width of section and it will be noted that they also carry shear blades, so that a positive shearing action is secured on all faces of the section. It is thus unnecessary to turn the beam or channel over or end for end in order to complete the cut. The angles of the upper shear blade are worthy of note, being so designed as to secure a minimum of



CHAMPION IRON CO.'S NEW BEAM SHEAR.

resistance and at the same time the blade does not clear both sides of the cut at the same instant, thereby giving the effect of a gradually diminishing load and smoother and quieter working.

The machine is capable of dealing with beams or channels up to 24 inches; the frame is of steel plate and the ram stroke is 15 inches. A 40-horsepower motor, running at 1,050 revolutions per minute, drives the ram at three and one-third strokes per minute through a belt and triple reduction gear, of which the last two steps are of cast steel. The weight of the complete machine is 54,000 pounds.

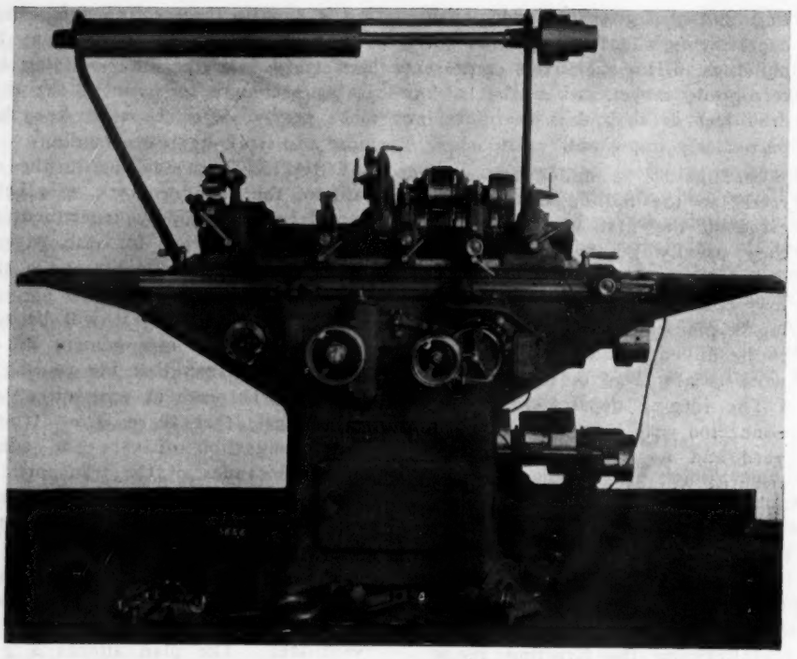
A New Cylindrical Grinder

The illustrations herewith show a new cylindrical grinder which has just been placed on the market by the Pratt & Whitney Co., Hartford, Conn. The machine is designed for medium size work and has a capacity of 30 inches between centers, with a swing over bed of 4 inches, and can be adjusted to a maximum taper per foot of 2 inches. The machine uses a 12-inch diameter wheel, with a face from ½ to 1¾ inches. Particular attention has been bestowed upon the table feeds and six changes have been provided for, any of which are immediately obtainable through a gear box and lever, the latter being located at the front of the machine, under the operator's hand. These feeds are independent of either wheel or work speeds. The reversing mechanism has been designed to effect reversal within 0.001 inch, a matter of considerable importance in grinding up to shoulders.

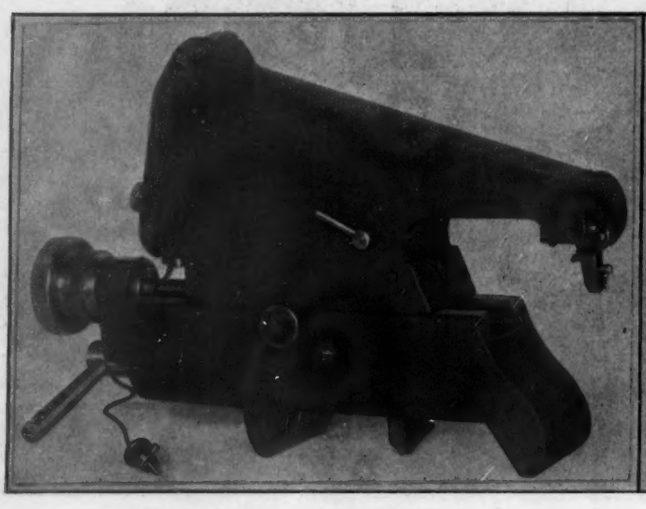
The form of the table top has also received particular attention and is made with a flat top and angular sides, in order to insure accurate relocation of attachments. The relation of the table top with the work table is maintained by a hardened stud fitted with a micrometer dial. The machine belongs to the type in which the wheel base is stationary and ample mass has been provided in the base to secure rigidity. The wheel slide is carried on this base in a dovetail bearing with taper gib adjustments and back lash in the feed screw is taken up by a counterweight.

The automatic sizing device with which this machine is fitted is one of the important recent improvements in cylindrical grinders and is described more fully in Mr. Hanson's paper on "Modern Grinding Methods," printed elsewhere, and which also includes a larger view of the operating mechanism. The automatic back rest is also a contribution to rapid production. Four work speeds are provided, as may be observed in the engraving, and are independent of table or wheel speeds. A belt tightener will be observed on the head stock for conveniently tightening and releasing the drive. A clutch is also provided in the head stock by which the work may be stopped or started at will.

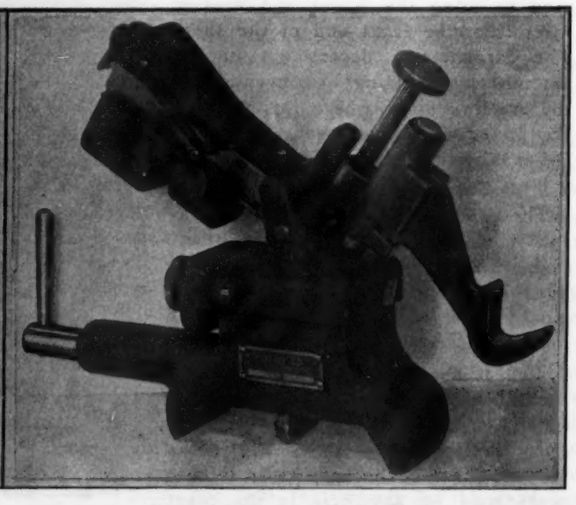
The importance of a liberal water supply is well known and has received special attention. An unusually large water tank is located at the back of the machine, where it is readily accessible for cleaning. Center and wheel truing devices are included in the equipment and the machine can be arranged for motor drive when desired.



NEW PRATT & WHITNEY CYLINDRICAL GRINDER.



THE AUTOMATIC SIZING DEVICE.



THE AUTOMATIC BACK REST.

POINTERS ABOUT NEW BUSINESS

(In order to assist the post office in delivering letters to new concerns, it is suggested that the names of incorporators be written in the lower left hand part of every envelope addressed to such new companies.)

New Buyers:—

The following manufacturing companies have filed articles of incorporation:

Peoria Metal Culvert Co., East Peoria, Ill.; $40,000; by A. B. Fink, F. J. Feldt, and W. V. Tafft.

The Foerderer Foundry Co., Indianapolis, Ind.; $10,000; by Anthony, Louis and George Foerderer.

The Reinforced Rail Joint Co., St. Louis; $8,000; Henry F. Roach, Mary G. Roach and John Gallup.

The Hercules Steel Co., Portland, Ore.; $100,000; L. G. Carpenter, W. E. Doane, and William E. Litzenberg.

Eagle Metallic Copper Co., Allentown, Pa.; capital, $5,000; by Preston E. Stern, A. L. Wickert and Thomas Zellner.

The Springer Whitaker Foundry Co., Terre Haute, Ind.; $10,000; by A. H. Springer, A. C. Whitaker, and M. A. Whitaker.

Reliance Wrench Mfg. Co., Racine, Wis.; $25,000; Andrew Watson, W. H. Hartig, J. J. Christophel, and Nels Christensen.

Canadian Electric Automatic Machines, Ltd., Ottawa; capital, $225,000; by John B. Prendergast, Norman G. Guthrie, Leslie S. Macoun and others.

Universal Mfg. Co., Racine, Wis.; $25,000; by E. B. Hand, Wallace MacGreagor, Maud Wild; to manufacture steering gears for motor cars and parts.

The Midland Sheet Metal Supply Co., St. Louis, Mo.; by George Hruska; K. Gertrude Bender, Frank F. Pieper and Edward S. Horwitz; $2,000 capital.

The Barber Car Co., Scranton, Pa.; $10,000; by Boyd A. Nusser, Scranton, Pa., C. E. Thompson, Phoenixville, Pa.; and Guy Webster, York, Pa.

The Huffman Printing Press Co., Ltd., Toronto; capital, $150,000; provisional directors, Thomas H. Barton, John A. Campbell, Chas. B. Nasmith and others.

The Zunner Machine Co., Rochester, N. Y.; boilers, machinery, hardware, etc.; $25,000; by John H. G. Zunner, William D. Clapp, Hugh Satterlee, all of Rochester, N. Y.

The Clip Bar Mfg. Co., Philadelphia, Pa.; $25,000; by Frederick J. Geier, 3134 Diamond street, Philadelphia; L. William Mulford, Narberth, Pa.; and A. E. Davis, Philadelphia, Pa.

The Foss Valve & Brass Mfg. Co., St. Louis, Mo.; by Clarence E. Anglin, William J. Gates, G. Howard Willett, John D. Everson, and Herbert R. Marlatt; capital $50,000.

Maximilian Pneumatic Tool & Machine Co., Ltd., Woodstock, Ont.; capital, $100,000; provisional directors, Dennis W. Karn, William T. Parke, Robert G. Bickerton and others.

The American Detinning Co., Connellsville, Pa.; to reclaim tin from scrap, etc.; $20,000; by R. S. Wile, C. E. Houston, A. B. Norton Jr., R. K. Long, Otto Stickel, K. K. Kramer, and J. Frederick Kurtz, of Connellsville, Pa.

The Sprague Machine Co., South Bethlehem, Pa.; $18,000; by William F. Danzer, 518 Seneca street, South Bethlehem, Pa.; Charles W. Snyder, Philadelphia, Pa.; William F. Danzer, Harvey W. Sprague and Isaac W. Miller, all of South Bethlehem, Pa.

The Duplexo Vacuum Cleaner Co., Brooklyn, N. Y., vacuum cleaners, etc.; $50,000; by Adolph C. Klindworth, 303 East Thirty-second street; Hugo Goldenberb, 110 West Twenty-ninth street, New York City; Max Fresch, 842 Madison street, Brooklyn, N. Y.

New Construction:—

Emil Koenig has secured a site for a new foundry at Upland, Cal., the dimensions of which will be 36 x 40 feet, of corrugated iron.

The Youngstown Bronze & Foundry Co., Youngstown, O., has taken out a permit to build a shop in Maumee street, estimated to cost $1,500.

The Power Roller Bearing Co., Detroit, is erecting a one-story reinforced concrete and brick shop on Hart street, estimated to cost about $15,000.

S. S. Wenzell Machine Co., Philadelphia, is taking figures on a building to be erected on the southwest corner of Fiftieth and Parkside avenue.

The Great Western Stove Co. is completing a four-story wholesale warehouse and salesroom at Oklahoma City, Okla., estimated to cost $75,000.

The Crown Iron Works Co., Minneapolis, has taken out a permit for a one-story brick and steel factory building, at 1320 Tyler street N. E. estimated to cost $10,000.

The Chicago Foundry Co., 2023-2027 North Thirty-seventh court, Chicago, has taken out a permit to build a two-story brick addition, estimated to cost $2,500.

The Railway Appliance Co., Chicago, advises regarding some recently noted proposed construction that it will make no addition to its plant before the latter part of the summer, but its plans are now being developed.

The C. C. & E. P. Townsend Wire Nail Co., New Brighton, Pa., has completed a three-story brick and concrete addition to its plant, giving employment to about 100 additional men. The new structure is 100 x 180 feet.

The Sunray Stove Co., Delaware, O., has decided to move its plant to Tulsa, Okla. A factory will be erected, the building to be fireproof, of steel and concrete, two stories, 50 x 100 feet. O. D. Hunt is general manager.

The Newark Tube & Metal Works, Newark, N. J., has begun erecting an extension which it will occupy as a furnace house, 100 x 110 feet, one story, of steel and brick. The Pittsburg Bridge & Iron Works has the contract for the steel work.

The Heer Engine Co., Portsmouth, O., is building a two-story structure, 80 x 160 feet, which will be equipped with additional facilities for the manufacture of the Heer two-cylinder heavy-duty engines. A 5-ton, 40-foot span crane will be installed in the center bay.

The Crawfordsville Wire & Nail Co., Crawfordsville, Ind., has let a contract for a tack factory, 75 x 197 feet, one-story, of steel construction, and gravel roof. The addition will cost, it is estimated, about $10,000,

and will be ready for occupancy the middle of February.

The Elizabeth City Iron Works & Supply Co., Elizabeth City, N. C., advises that its machine shop and foundry were so seriously damaged by fire, Dec. 14, that it will be necessary to rebuild. A fireproof building will be erected in which new equipment will be installed.

The Ward Nail Co., of which H. B. McMaster is general manager, will occupy the former Cooper Gear works, Struthers, O., which will be remodeled for the company's purposes. The company will manufacture nails by a machine patented by David B. Ward. It is expected that the plant will be operating March 1.

H. W. Clark Co., Mattoon, Ill., manufacturer of the Clark meter box and waterworks appliances, is contemplating building a modern factory (both iron and brass) and a machine shop. Building operations will commence in the early spring. The company is desirous of securing information as to buildings, arrangements, equipment, etc.

The Union Steel Co., Plainfield, N. J., whose incorporation was recently noted, has taken over the Astle Tool Co. plant, Annandale. It will enlarge the plant and add to the output the manufacture of various lines of high grade tools. The incorporators include T. F. Budlong, of Plainfield; George W. Astle, of Annandale, and E. P. Baylor, of Hampton, N. J.

The Fulton Brass Foundry Co., South Bend, Ind., of which F. H. Fulton is proprieter, has begun operating in shops rebuilt and enlarged at Williams street and Indiana avenue, formerly occupied by the Edmonson Concrete Machinery Co. An additional concrete block building was erected, giving the new plant a total floor space of 3,500 feet. The company carries on a jobbing trade in brass, aluminum, and other metals.

The Osborne & Sexton Machinery Co., Columbus, O., has leased the buildings formerly occupied by the Buckeye Steel Castings Co., North Fourth street, being in need of larger quarters. The buildings have been remodeled, and a modern machine and repair shop installed. The officers of the Osborne & Sexton company are: President and general manager, James J. Sexton; vice president and treasurer, George J. Mooney; secretary, John O'Brien.

General Industrial:—

The Detroit Gear & Machine Co., Detroit, has increased its capital from $100,000 to $150,000.

The Russell Motor Axle Co., Detroit, has increased its capital from $100,000 to $150,000 to take care of increasing business.

Crane Co., of Chicago, has decided to give as a Christmas present to each employe 10 per cent of his yearly wages. The gifts will amount to $425,000 this year.

The Ellwood City Forge Co., Ellwood City, Pa., placed its new plant in operation, Dec. 12. John Evans is president and David Evans secretary and manager of the company.

The Metropolis Construction Co., having contracts with the City of San Francisco to the amount of $200,000, went into the hands of a receiver on Dec. 12. Liabilities amount to $125,000.

Obenberger Drop Forge Co., Milwaukee, advises respecting its recently noted increase of capital that it has been adding to equipment which necessitated the capital increase. It does not contemplate making additions to its plant at this time.

The directors of the Owosso Motor Co., Owosso, Mich., have asked for the appointment of a receiver and the dissolution of the company. J. P. Waters, of Detroit, superintendent of the company, has been named receiver. A hearing will be had March 7.

The name of the Rogers-Conklin Mfg. Co., Joplin, Mo., has been changed to the Rogers Foundry & Mfg. Co. The officers are as follows: J. A. Rogers, president and manager; Ellis Rogers, vice president, and Chas. B. Rogers, secretary and treasurer.

The A. J. Clark Mfg. Co., Youngstown, O., has been organized with a capital of $50,000. The incorporators are J. V. Price, A. J. Clark, A. W. Hartshorn and R. K. Cuthbert. The company will build improved acetylene gas plants. No announcement has been made as yet regarding a site for a plant.

The Kibbe-Workinger Co., Elkhart, Ind., whose incorporation was recently noted, advises that it is the successor to the Edward Kelly Foundry Co., whose affairs were placed in the hands of a receiver and sold out. It will continue the business under its new name, and at the plant formerly occupied by the Kelly company.

The Casey-Hedges Co., Inc., Chattanooga, Tenn., advising concerning its recently noted fire damage, says that the building destroyed was 100 x 150 feet, of iron and steel construction. As to rebuilding, it advises further that the contract for the steel work has been awarded the Converse Bridge Co., of Chattanooga, but the wood work construction it will do itself. The Casey-Hedges Co. has a large stock of manufactured products and the fire will not prevent it from filling all orders promptly.

The Wasson Piston Ring Co., 94-104 West Seventh street, Bayonne, N. J., which was recently incorporated, advises that it has made temporary arrangements for its plant by renting at the above mentioned address, and does not contemplate building in the near future. Its output is limited at this time entirely to piston rings, in the manufacture of which it is a specialist. When completed, its equipment will be almost entirely automatic, and it aims to make its product of the highest quality of material and workmanship. Its ring is of special design made by a patented process with patented machinery.

The Gramm Motor Truck Co. of Canada, Ltd., Walkerville, Ont., whose incorporation was noted recently, advises that it was organized with $150,000 capital to manufacture the Gramm motor truck in Canada as built by the Gramm Motor Car Co., at Lima, O. Agencies are being established throughout Canada, but it is planned to build no more than 150 trucks the first year. A completely equipped factory building has been secured at Walkerville. Deliveries are being made at this time, this being the first company to build a complete line of heavy trucks in the Dominion.

Trade Note:—

Tht office of J. Brooks Fenno & Co., pig iron and coke, Boston, has been removed to the Boston Safe Deposit & Trust building, 201 Devonshire street, from 44 Kilby street, a location which they had occupied for about 40 years. The building upon this site is now being demolished.

Fishbein & Gross, Cleveland, iron and steel scrap, announce that they have purchased the yard and machinery of the S. M. Shimer Co., of Newburg, O., including the real estate of two acres, shops, buildings and their fixtures. They will operate the Newburg yard as well as the original yard at Windsor and the C. & P. railroad.

Fires:—

The works of the Eastern Metal & Refining Co., Charlestown, Mass., were badly damaged by fire, Dec. 9, the loss being estimated at $2,000.

The factory of the Ely Mfg. Co., Girard, Pa., manufacturing hardware specialties, was badly damaged, Dec. 17. The loss is estimated at $30,000, with insurance of $15,000.

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IN THIS ISSUE: Determination of Moisture in Blast Furnace Air---Modern Grinding Methods

THE IRON TRADE REVIEW

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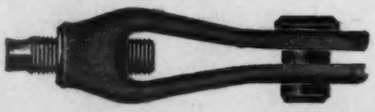

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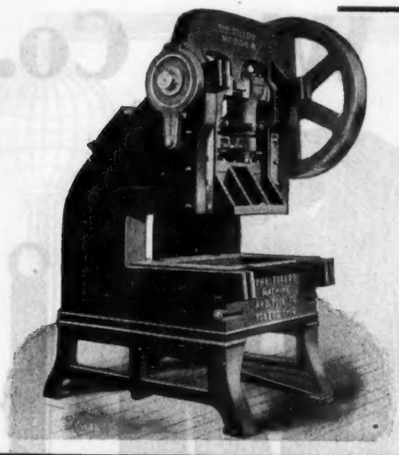

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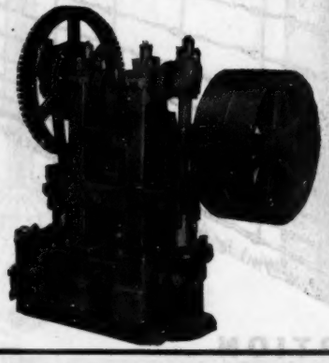

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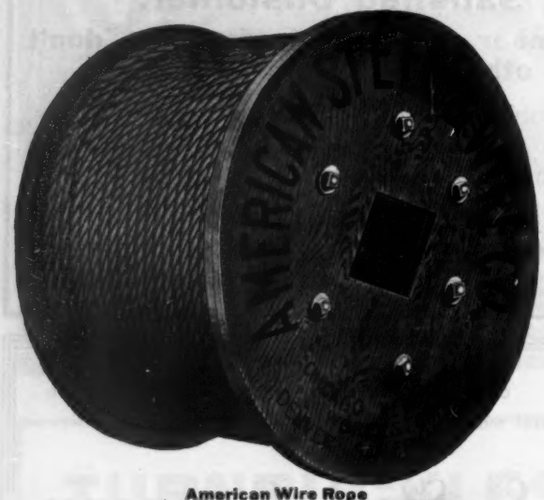
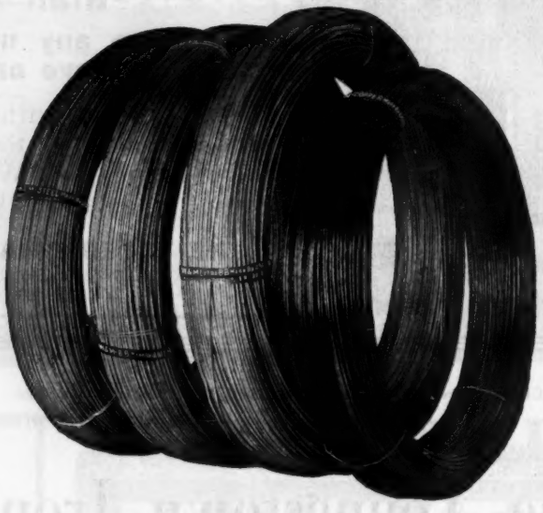
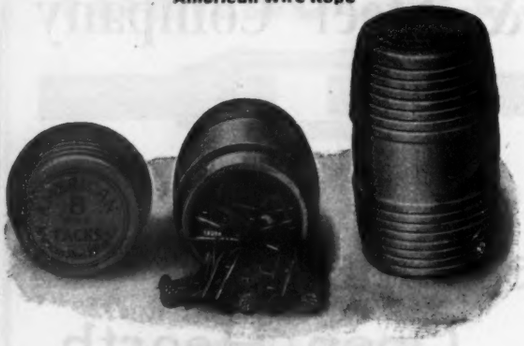


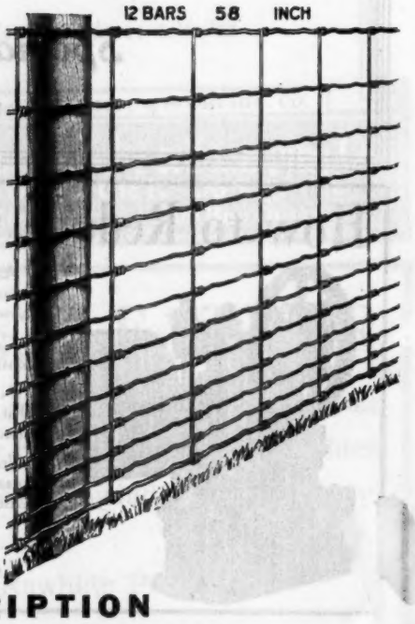
American Wire Rope



W. & M. Telephone Wire



American Wire Nails



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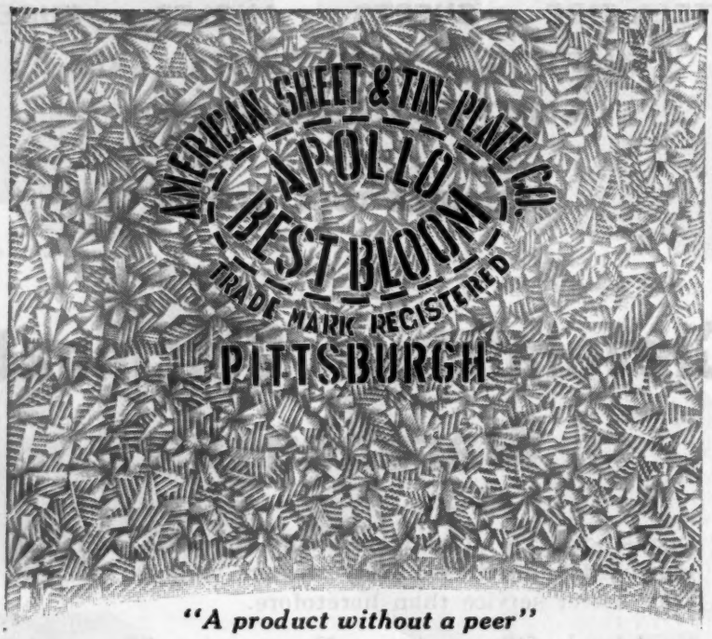

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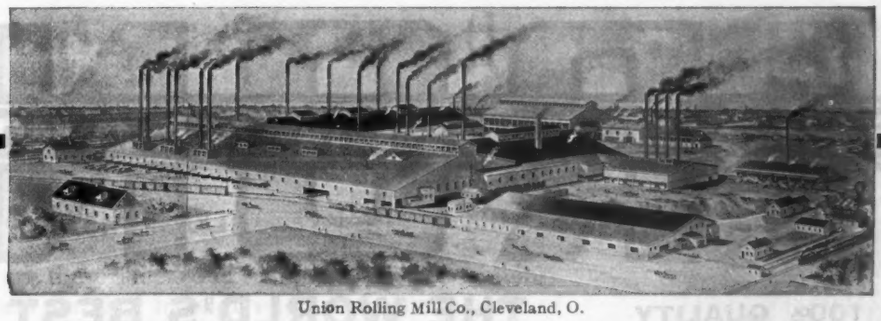

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An Interesting Leaflet

THE Butler Manufacturing Company of Kansas City, makers of galvanized tanks, cisterns, corn-cribs and a hundred other useful articles, buy

INLAND BASIC OPEN HEARTH GALVANIZED SHEETS

So reliable are these sheets and so far superior to ordinary galvanized sheets that they have given them the trade name of RUS-PRUF, and the durability of their "Rus-Pruf" products has already won national fame.

This enterprising firm has recently issued the following interesting leaflet:

Round Stock Tanks

Some Facts About "So-Called Irons" Used in Culvert Construction

There are at least half a dozen manufacturers of "so-called iron" sheets, each of whom claims the *only* "secret process" for making "pure, rust-resisting iron," but their products are all practically the same and show the same results from acid tests.

Now if these smaller companies have each found apparently the SAME secret why have not the largest and most progressive manufacturers of galvanized sheets in the world, who employ the highest salaried experts in the United States, made the same discovery and used it to increase their growing business?

There can be but one answer: There is nothing in the secret nor special merit in the "so-called iron."

All of these manufacturers of "so-called iron" use the acid test to prove the durability of their "irons," claiming that because their metals show such a small loss when immersed in the sulphuric acid bath they will last longer in the earth than other tight coated galvanized steel.

Dr. Allen S. Cushman of Washington, D. C. (so often quoted), in his report at the annual meeting of American Society for Testing Materials at Atlantic City, June 23-27, 1908, said: "It cannot be said that the results of the acid test are an indication of the rust-resisting power of metals, and certainly, according to the committee, they are not a basis for inferring that metal manufactured by one process is superior to that manufactured by another."

In other words, the acid test determines practically nothing regarding the lasting qualities of "so-called iron" and steel.

You can take two pieces of steel, run one of them through the cold rolls three or four times and then immerse both in the acid bath and the cold rolled piece will show almost no signs of corrosion. If the test were a fair one, there should be absolutely no difference, but there is, and anyone can prove it.

Again, take a piece of zinc and bury it in ordinary soil and it will last a century. It does not corrode. Put it in the acid and it is immediately entirely dissolved. If this acid test proved anything about the lasting qualities of metals in the earth, zinc, then, would endure about a week.

But when all has been said and done the surest proof of durability is found in actual service. That's why we use special culvert sheets that have stood the acid test of time, and have been in use eight years longer than any "so-called irons."

Every one of the manufacturers of "so-called iron" claims that the metal is non-corrosive and absolutely rust-resisting. Let's test this claim.

Just scale off the galvanizing from a piece of these sheets and leave the surface exposed to the dampness. In a short time you'll be able to see a red coating of rust.

If it were so pure and so non-corrosive why should it show ANY signs of corrosion? But it does, and that's why they galvanize it. Otherwise it would be a foolish waste of money to put on "a perfect galvanized coating."

The very fact that it is galvanized and that it does show rust when exposed to the elements proves beyond the shadow of a doubt that it is not rust-resisting.

All authorities agree without exception that the secret of securing a material that will not corrode is in protecting the base metal with a sufficient covering.

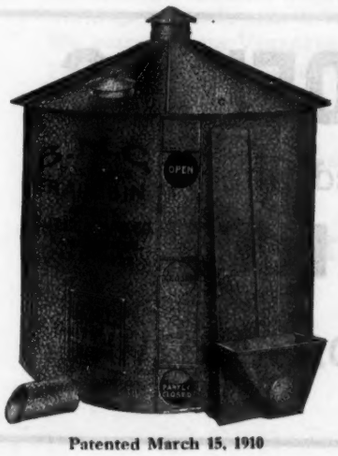
The "so-called-iron" people deny the necessity for this in their arguments, but in their practice work night and day to put on a "perfect galvanized coating" to make their "iron" lasting.

Why waste time and money and add to the cost by galvanizing if it is rust-resisting?

The whole matter resolves itself into this: Durability depends upon the GALVANIZING.

That's why we use special B. M. C. RUS-PRUF sheets, which are conceded to have the heaviest, tightest and best coating of any material on the market, and whose quality is backed by the greatest company of its kind in existence.

Butler Manufacturing Co.
Kansas City Minneapolis



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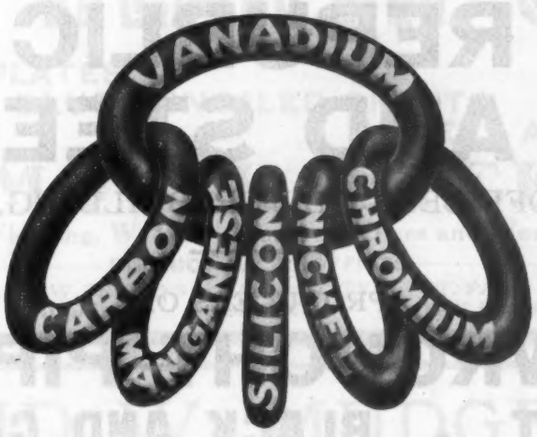

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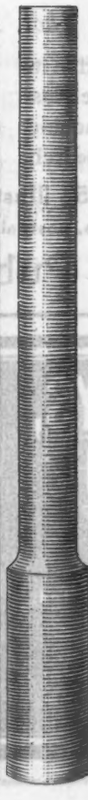

The other is a plain casting. The illustrations are not extreme or exaggerated. They were reproduced from actual photographs. The sound casting was poured after 0.3% Titanium Alloy had been added to the molten metal. That made the difference.

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33

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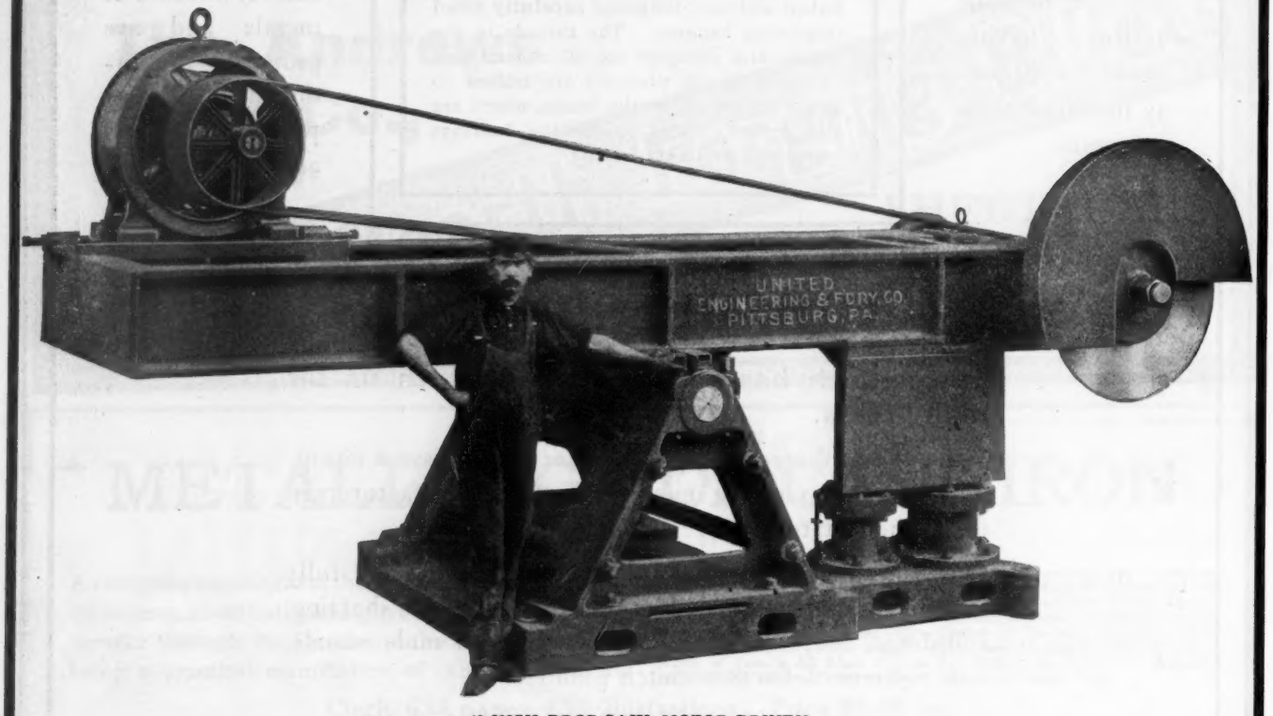

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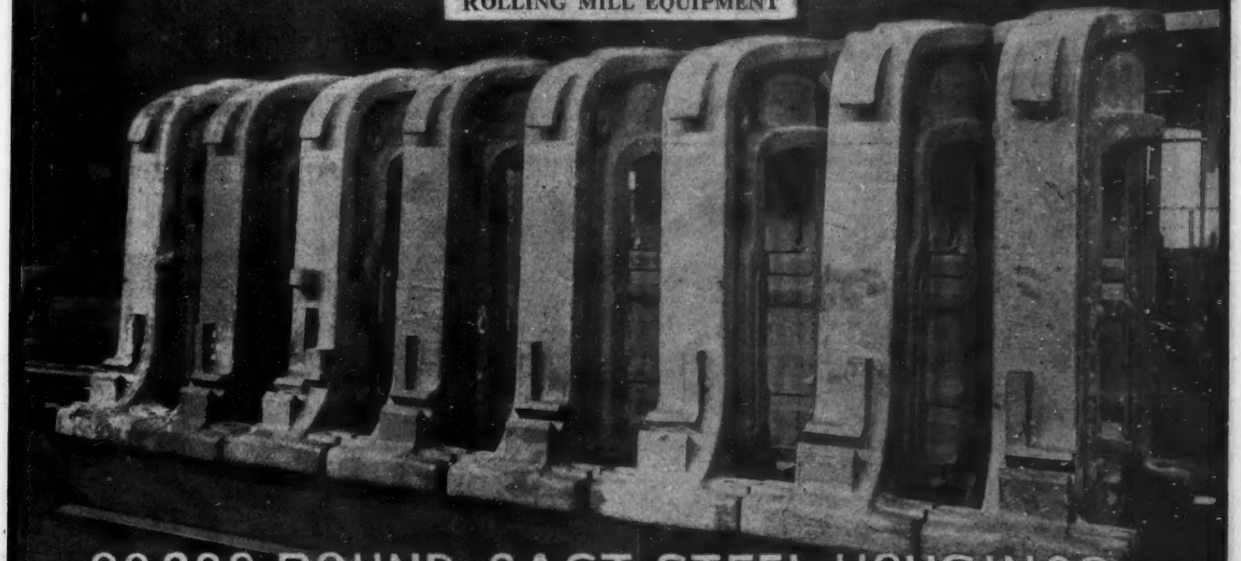

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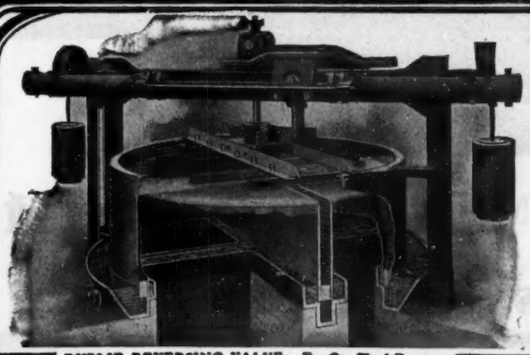

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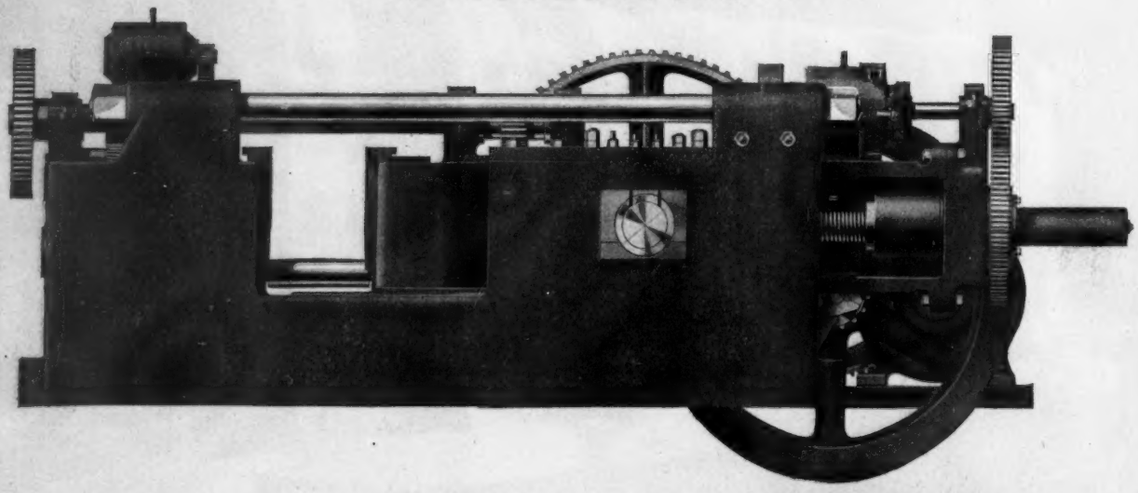

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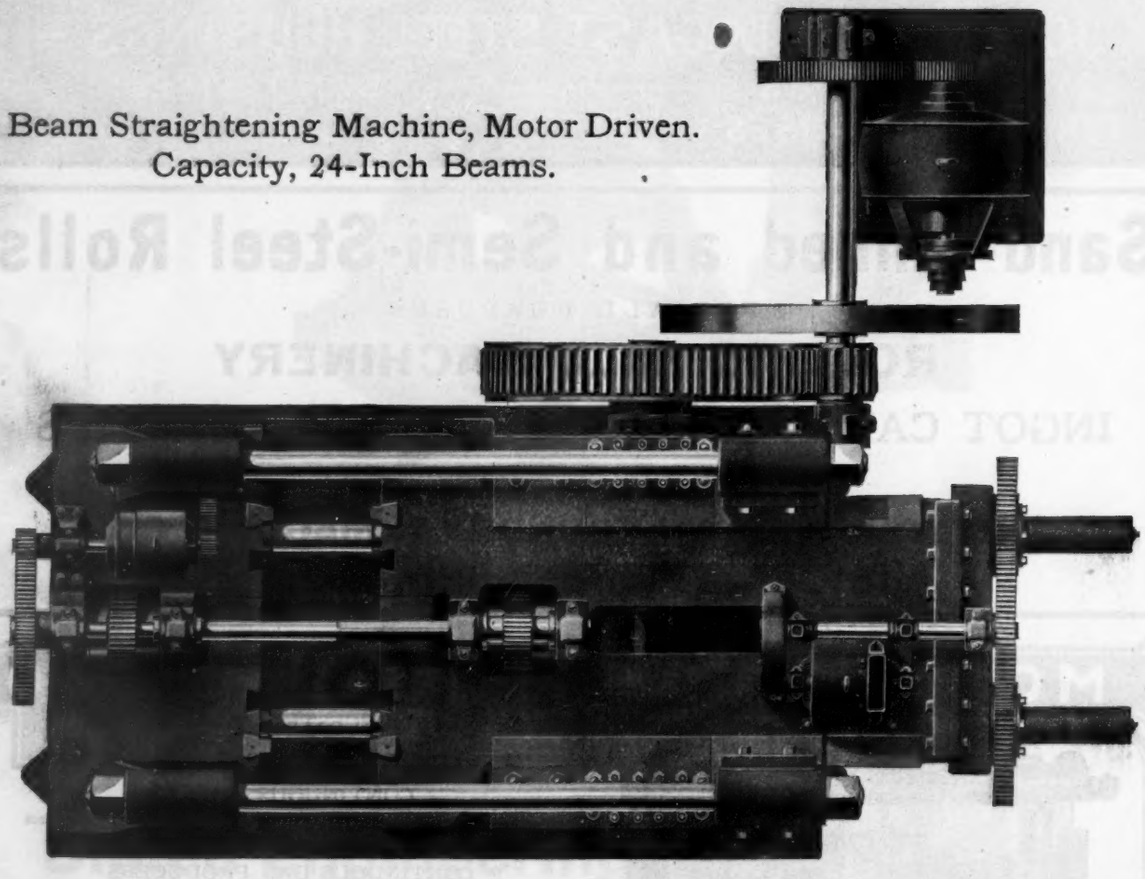

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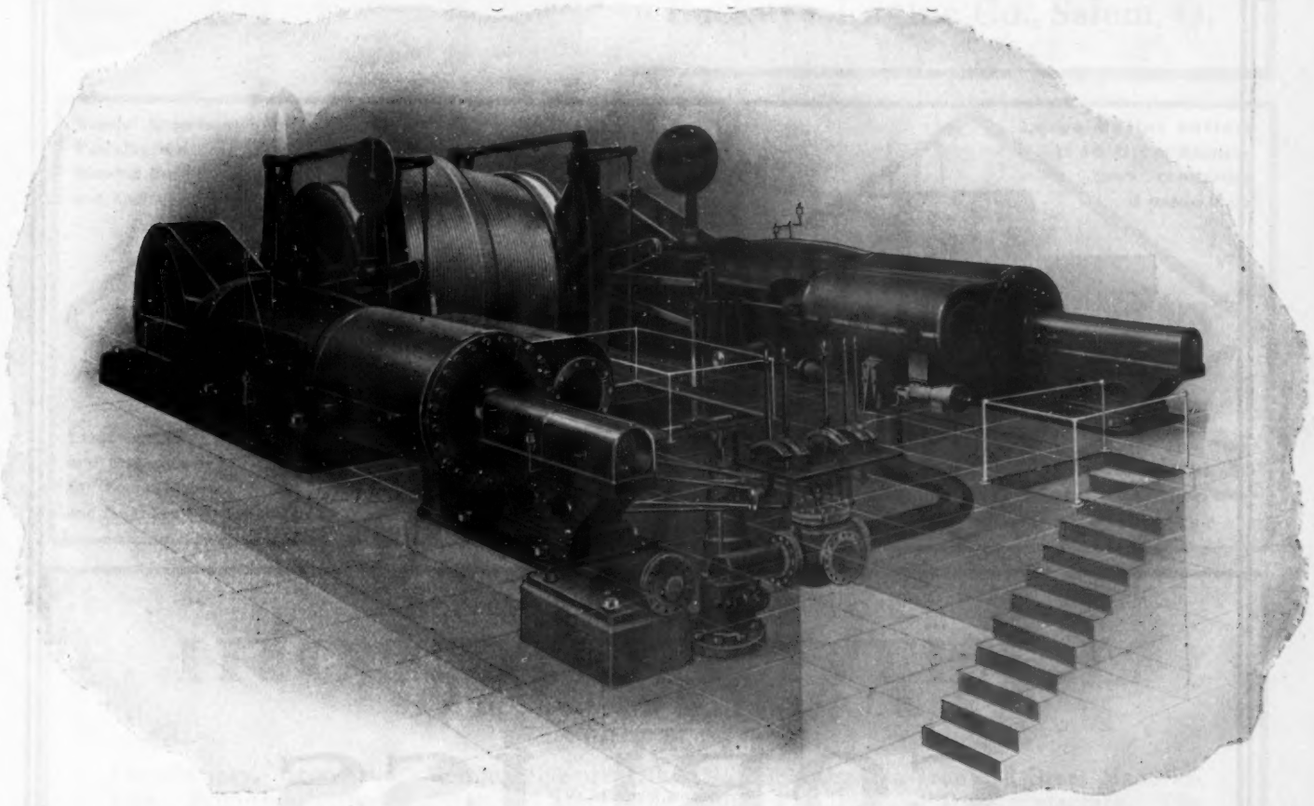

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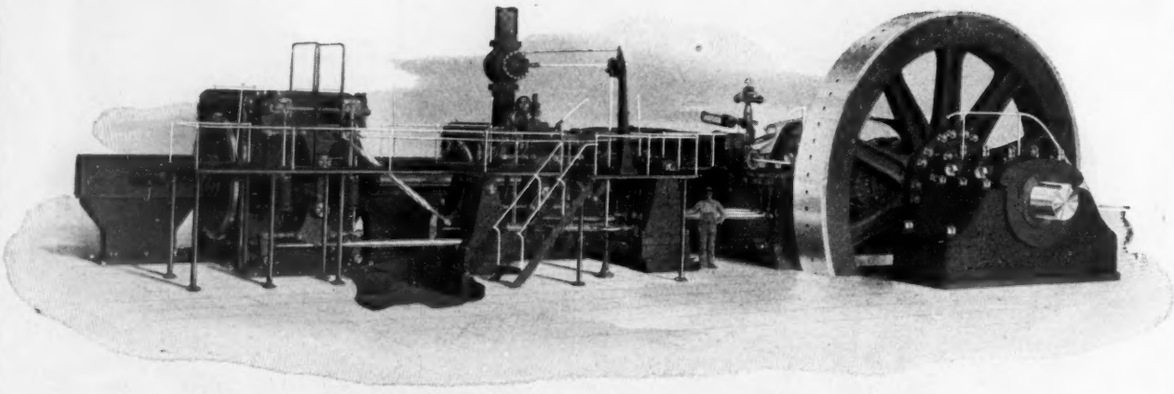

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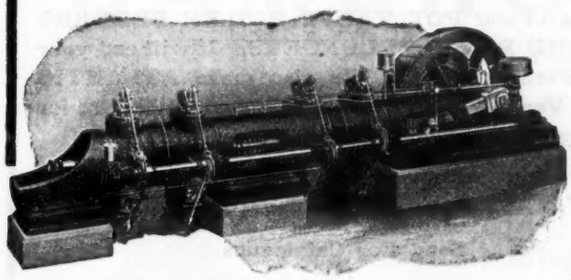

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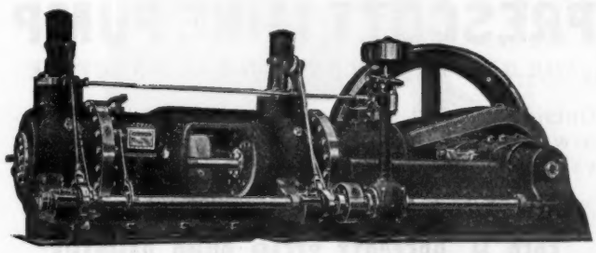

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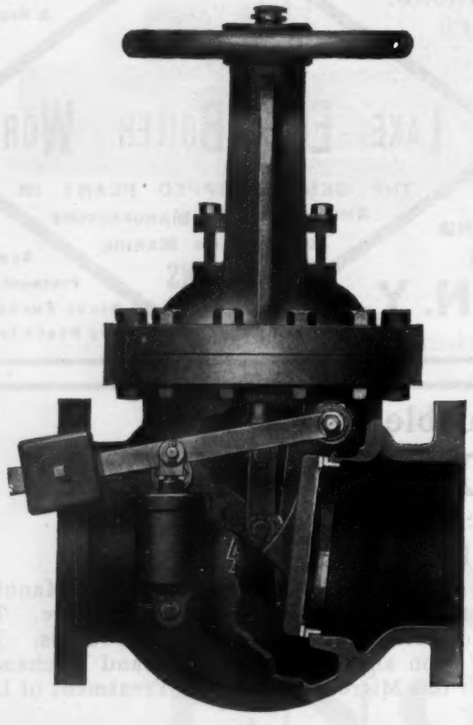

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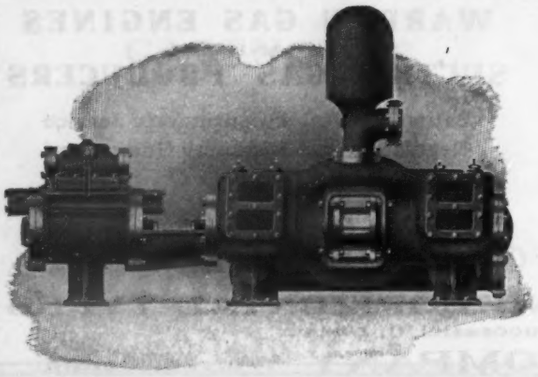

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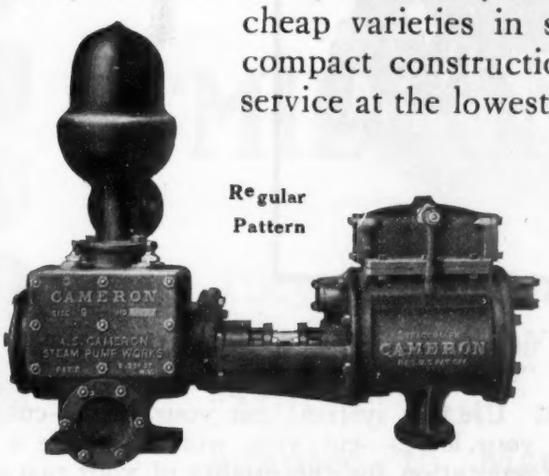

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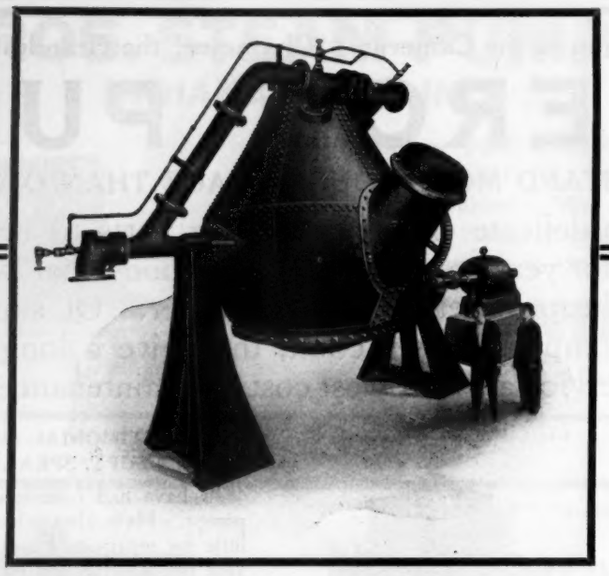

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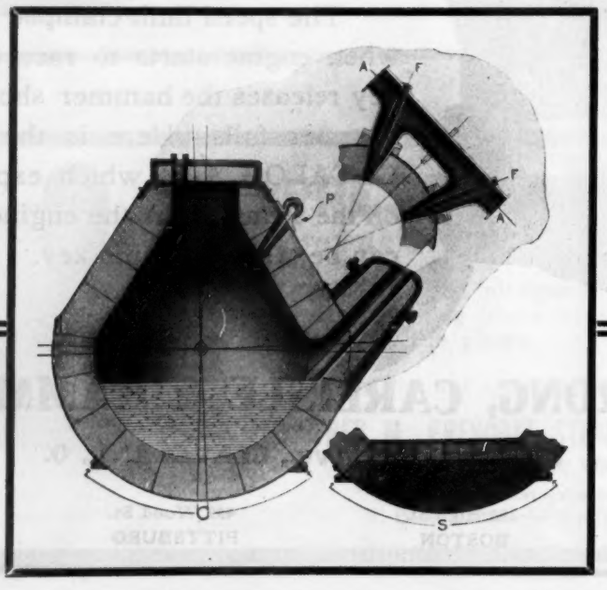

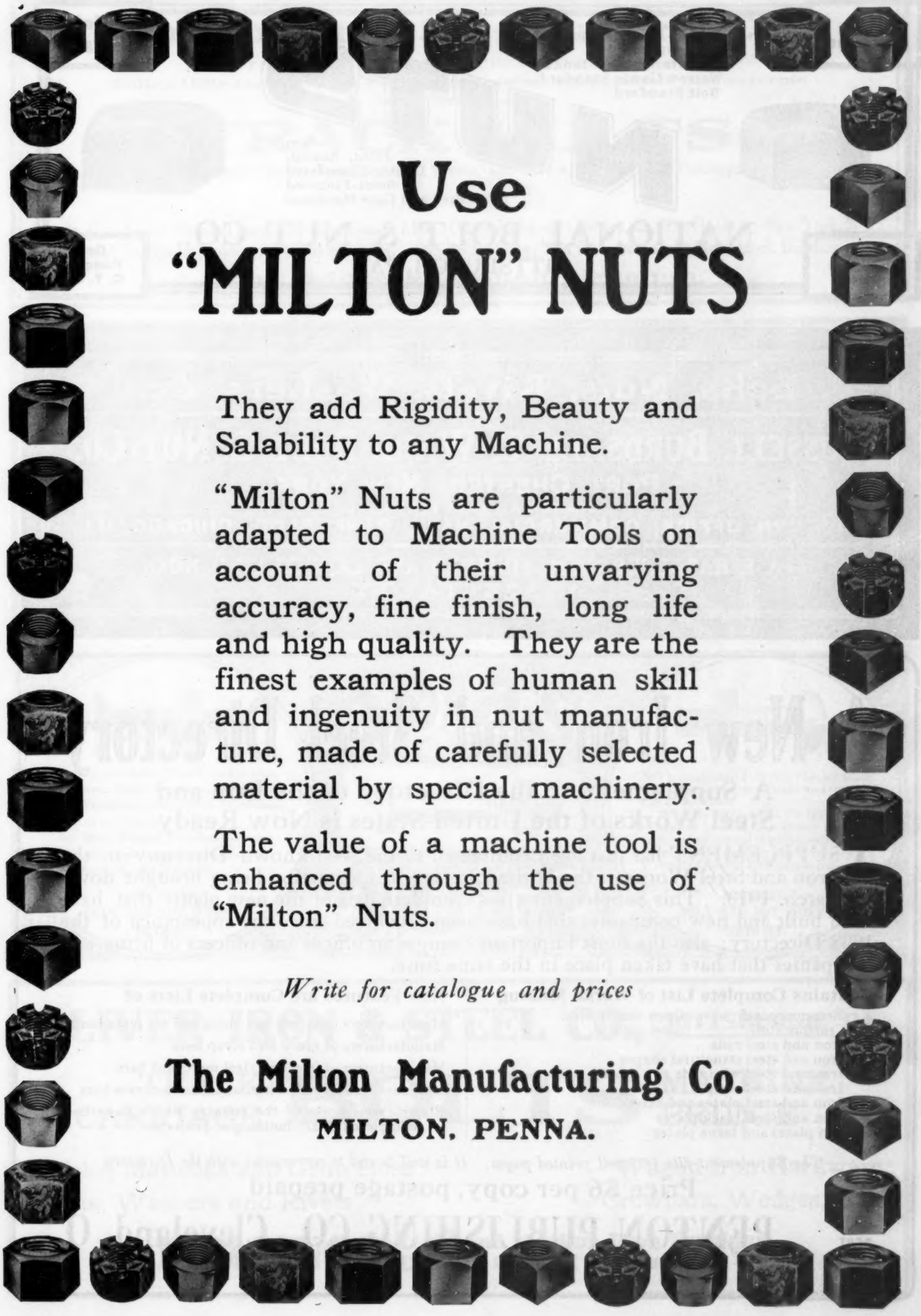

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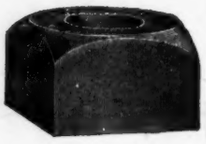

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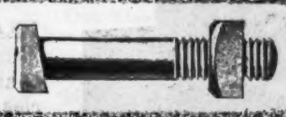

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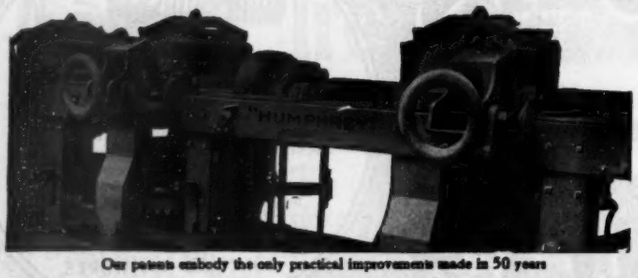

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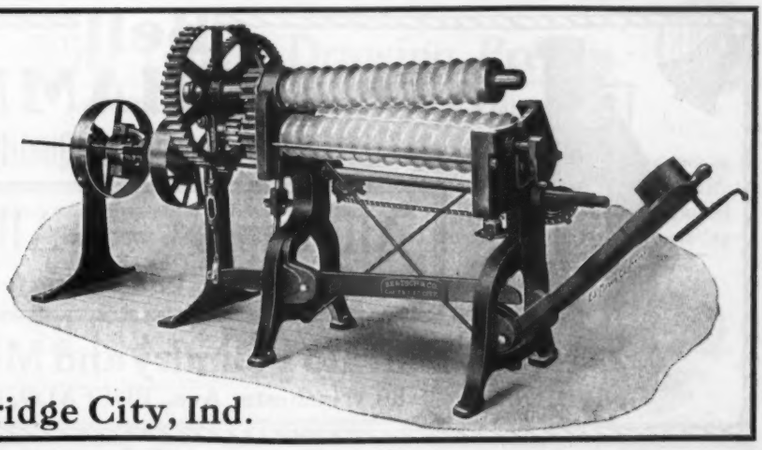

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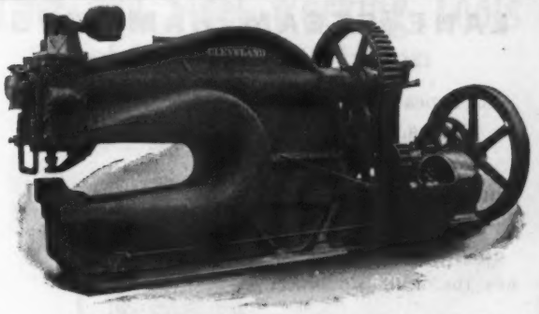

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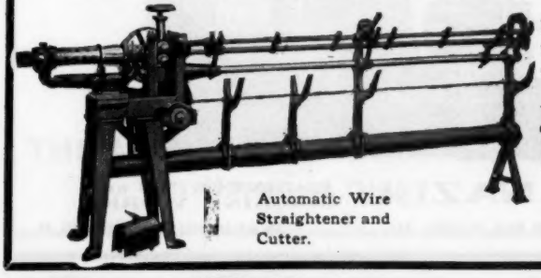

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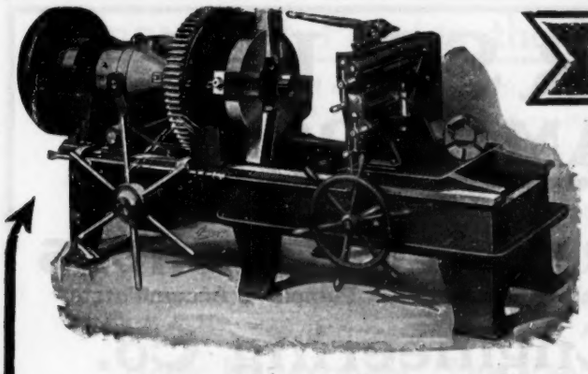

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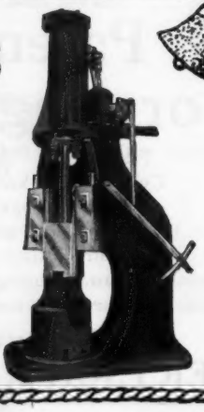

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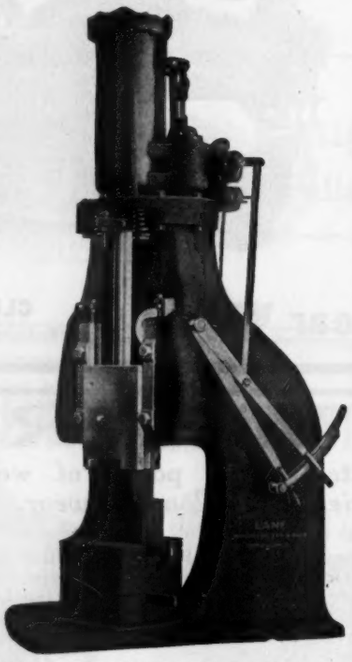

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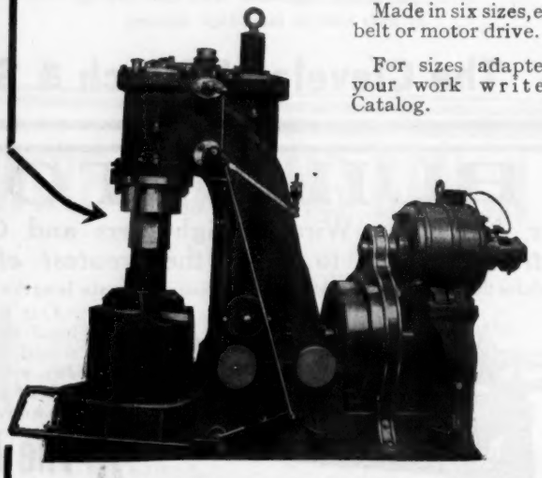

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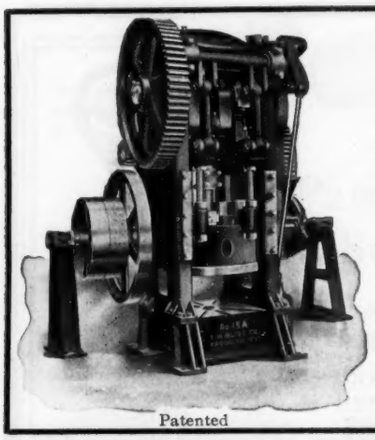

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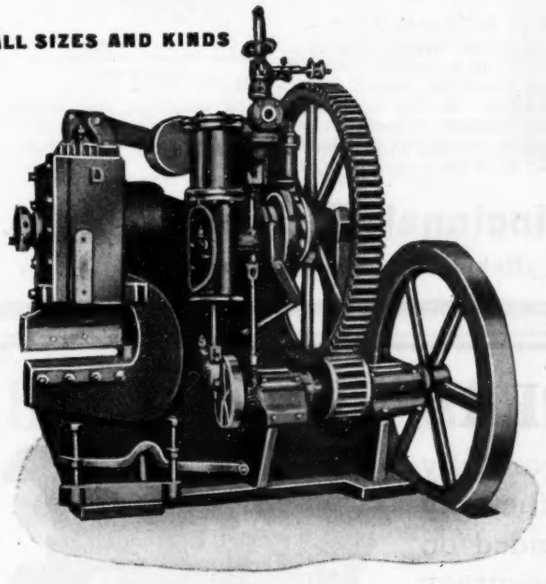

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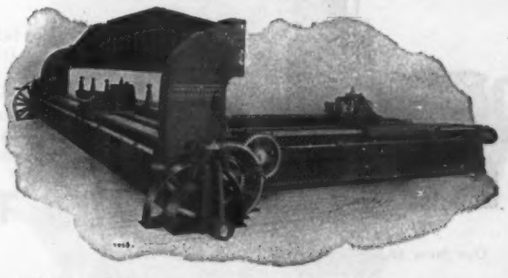

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The book is devoted almost exclusively to such things as perplex the molder in his every-day experience. It treats fully of core-making; loam, dry sand and green sand molding, crystallization, shrinkage, contraction of cast-iron, pressure in molds, gives formulas for mixtures of iron, tables, rules, etc. Bound in cloth, 382 pages, 208 illustrations, **PRICE $2.50.**

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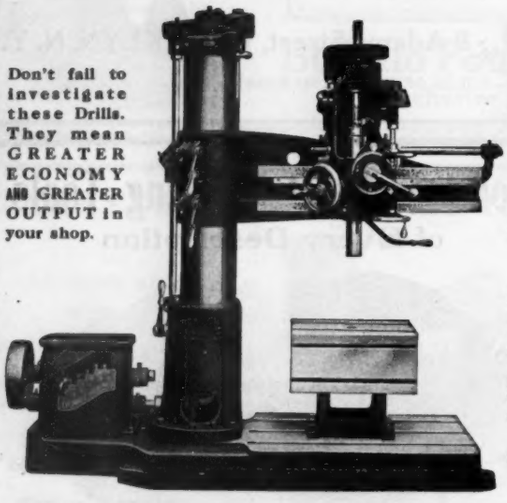

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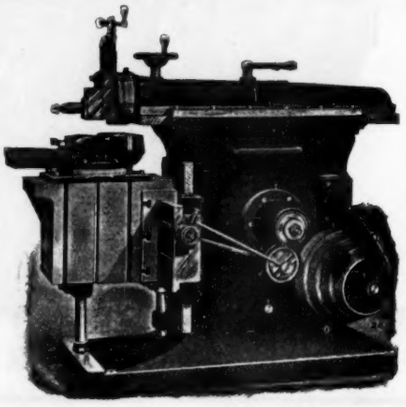

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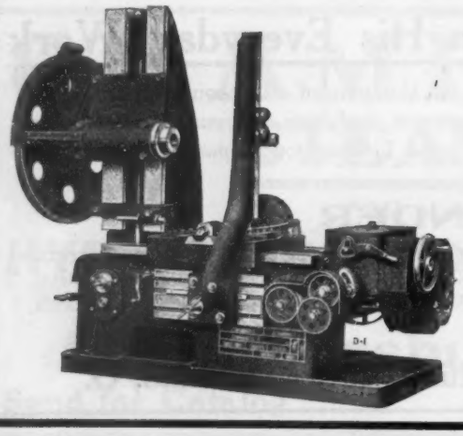

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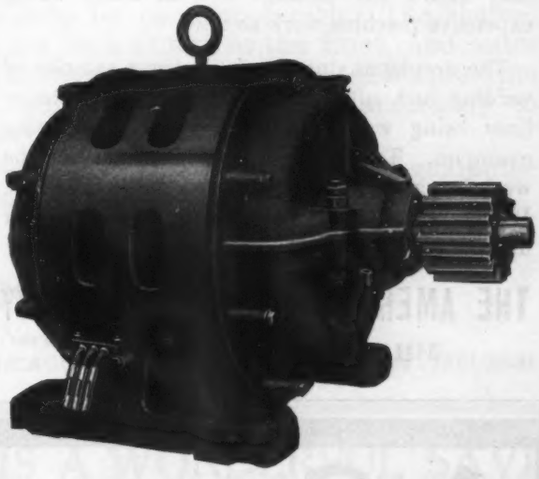

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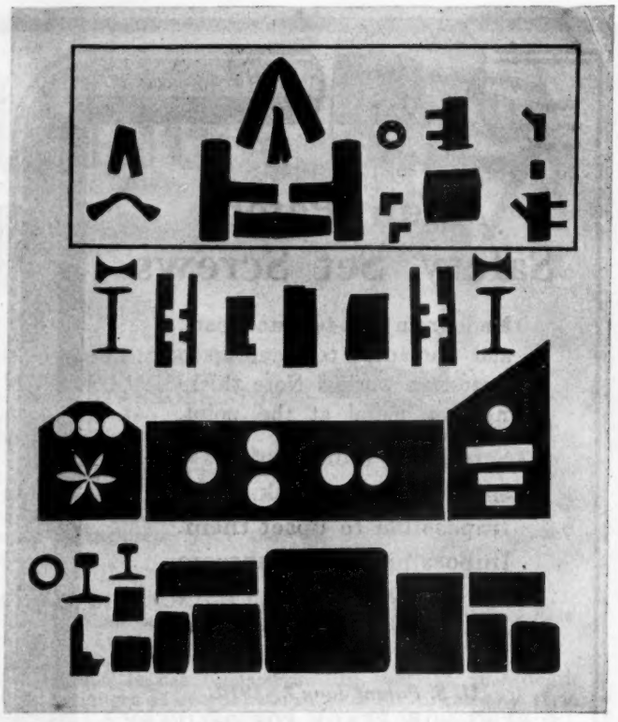

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And the size is the only difference between the "Cadet" and the largest and best core oven built. In the small foundry, where economy of space is absolutely necessary, the "Cadet" is *the* thing. And—it is portable. If you find that you need the space it occupies—put it some other place, out of the way. In spite of its light weight it is as strongly built and as solid as the largest stationary oven.

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Try this oven in your core-room. We will guarantee it to give you satisfaction in every way.

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"Gee whizz!" he says; "I never dreamed there could be such an elevator."

"Why, she goes just like an angel!"

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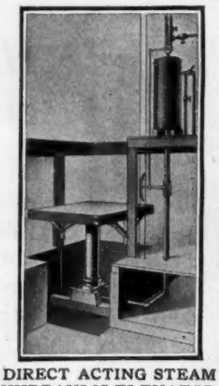
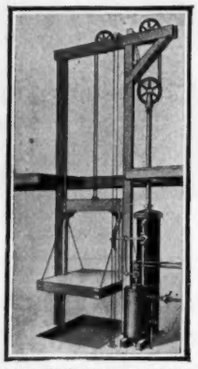
We can't tell all we know in a newspaper advertisement, but if you were half smart you would guess there must be a reason why everybody wants to

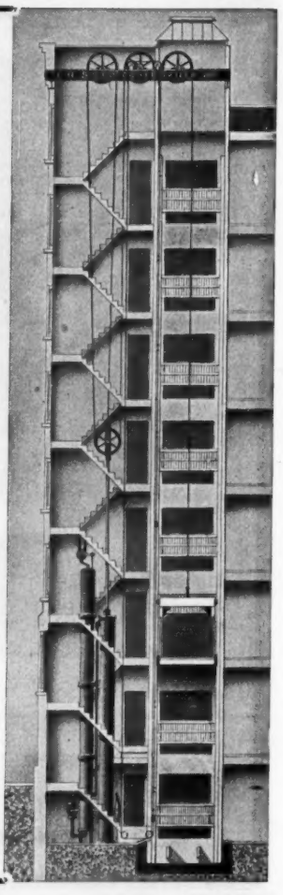
Hook 'er to the Biler



DIRECT ACTING STEAM HYDRAULIC ELEVATOR



DOUBLE GEARED STEAM HYDRAULIC ELEVATOR



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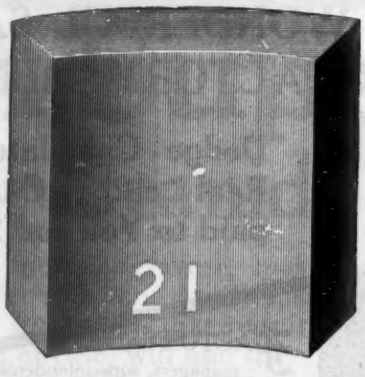

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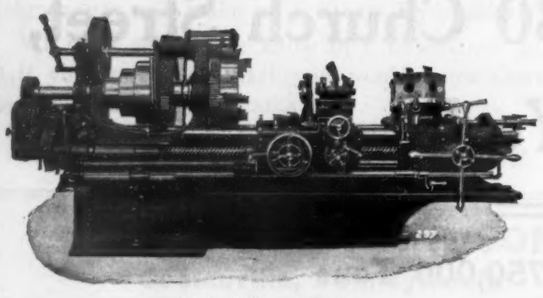

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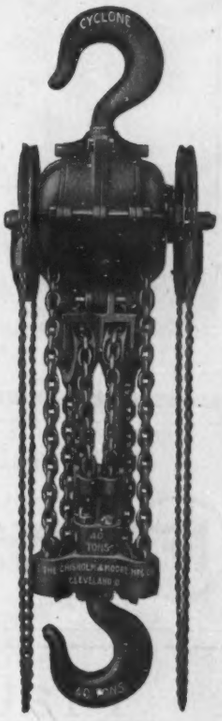

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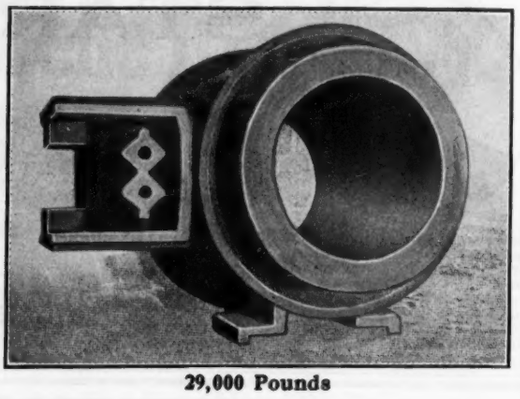

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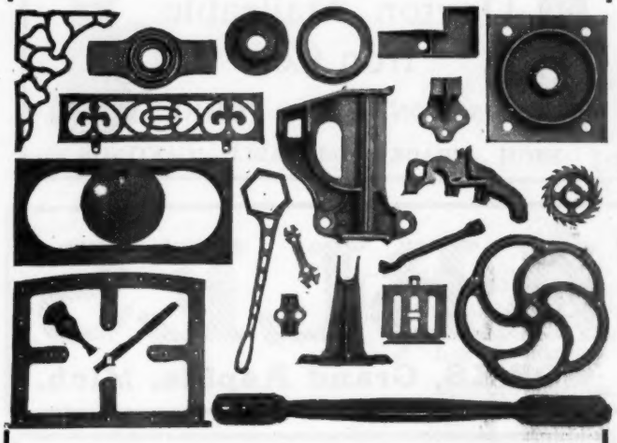

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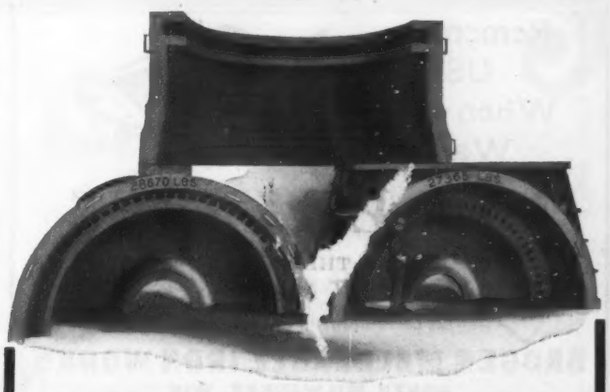

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Auburn Ball Bearing Co., Rochester, N. Y.
Dodge Mfg. Co., Mishawaka, Ind.
Enterprise Metal Co., Syracuse, N. Y.
Jones & Laughlin Steel Co., Pittsburg, Pa.
Stephens-Adamson Mfg. Co., Aurora, Ill.

BEDS.
(Cooling.)
Morgan Construction Co., Worcester, Mass.

BELLOWS.
(Foundry.)
Obermayer, S., Co., Cincinnati, O.

BELTING.
(Link and Conveying.)
Dodge Mfg. Co., Mishawaka, Ind.
Jeffrey Mfg. Co., Columbus, O.
Stephens-Adamson Mfg. Co., Aurora, Ill.

BELTING.
(Rawhide.)
Chicago Rawhide Mfg. Co., Chicago, Ill.

BENCHES.
(Draw, Wire, Rivet and Bolt Works.)
Morgan Construction Co., Worcester, Mass.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.
Waterbury Farrel Fdy. & Mch. Co., Wat'rby, Ct.

BILLETS.
Addy, Matthew & Co., Cincinnati, O.
American Rolling Mill Co., Middletown, O.
American Steel & Wire Co., Chicago, Ill.
Andrews Steel Co., Newport, Ky.
Bourne-Fuller Co., Cleveland, O.
Cambria Steel Co., Johnstown, Pa.
Carnegie Steel Co., Pittsburg, Pa.
Inland Steel Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburg, Pa.
LaBelle Iron Works, Steubenville, O.
Lackawanna Steel Co., New York City.
North Works, Chicago, Ill.
Otis Steel Co., Ltd., Cleveland, O.
Portsmouth Steel Co., Portsmouth, O.
Republic Iron & Steel Co., Pittsburg, Pa.
Stewart Iron Co., Ltd., Cleveland, O.
Taylor, N. & G., Co., Philadelphia, Pa.
Tennessee Coal, Iron & R. R. Co., Pittsburg, Pa.
Wood, Alan, Iron & Steel Co., Philadelphia, Pa.

BITS.
(Bracer and Machine.)
Progressive Mfg. Co., Torrington, Conn.

BLOCKS.
(Chain.)
Chisholm & Moore Mfg. Co., Cleveland, O.

BLOCKS.
(Cupola.)
American Refractories Co., Chicago, Ill.
Ashland Fire Brick Co., Ashland, Ky.
Harbison-Walker Refractories Co., Pittsburg, Pa.
Obermayer, S., Co., Cincinnati, O.
Pyro Clay Products Co., Oak Hill, O.
Stevens, F. B., Detroit, Mich.
Stowe-Fuller Co., Cleveland, O.

BLOOMS.
Carnegie Steel Co., Pittsburg, Pa.
Hillman, J. H., & Son, Pittsburg, Pa.
Inland Steel Co., Chicago, Ill.
LaBelle Iron Works, Steubenville, O.
Lackawanna Steel Co., New York City.
National Tube Co., Pittsburg, Pa.
Tennessee Coal, Iron & R. R. Co., Pittsb'g, Pa.
Wood, Alan, Iron & Steel Co., Phila., Pa.

BLOWERS.
American Blower Co., Detroit, Mich.
Cameron Steam Pump Works, New York City.
Eynon-Evans Mfg. Co., Philadelphia, Pa.
General Electric Co., Schnectady, N. Y.
Green Fuel Economizer Co., Matteawan, N. Y.
Sirocco Engineering Co., Detroit, Mich.

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BOILERS.

Baird Machinery Co., Pittsburg, Pa.
Canton Boiler & Engrg. Co., Canton, O.
Cooper, C. & G., Co., Mt. Vernon, O.
Industrial Works, Bay City, Mich.
Lake Erie Engineering Works, Buffalo, N. Y.
Pfannmueller Engineering Co., Chicago, Ill.
Riter-Conley Mfg. Co., Pittsburg, Pa.
Sharon Boiler Works, Sharon, Pa.
Shaw-Kendall Engineering Co., Toledo, O.
Struthers-Wells Co., Warren, Pa.
Toomey, Frank, Philadelphia, Pa.
Vandyck-Churchill Co., New York City.
Worth Bros. Co., Coatesville, Pa.

BOILER SETTINGS.

(Fire Brick.)

Ashland Fire Brick Co., Ashland, Ky.
Harbison-Walker Refractories Co., Pittsburg, Pa.
Pyro Clay Products Co., Oak Hill, O.

BOILERS.

(Marine.)

Worth Bros. Co., Coatesville, Pa.

BOILERS.

(Tubular.)

Worth Bros. Co., Coatesville, Pa.

BOLTS.

American Bridge Co. of New York, N. Y.
Cincinnati Iron & Steel Co., Cincinnati, O.
Graham Nut Co., Pittsburg, Pa.
Lebanon Valley Iron & Steel Co., Lebanon, Pa.
Michigan Bolt & Nut Works, Detroit, Mich.
Milton Mfg. Co., Milton, Pa.
National Bolt & Nut Co., Pittsburg, Pa.
Oliver Iron & Steel Co., Pittsburg, Pa.
Republic Iron & Steel Co., Pittsburg, Pa.
Rockford Bolt Co., Rockford, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Ryerson, Joseph T., & Son, Chicago, Ill.
Steel Car Forge Co., Pittsburg, Pa.
Upson Nut Co., Cleveland, O.

BOOKS.

Penton Publishing Co., Cleveland, O.

BOXES.

(Annealing.)

Canton Boiler & Engrg. Co., Canton, O.
United Engineering & Fdy. Co., Pittsburg, Pa.
Wilfong Iron Works Co., M. F., Philadelphia.

BOXES.

(Charging.)

Morgan Engineering Co., Alliance, O.

BRAKES.

Cincinnati Iron & Steel Co., Cincinnati, O.

BRAKES.

(Disc.)

Cutler-Hammer Clutch Co., Milwaukee, Wis.
Cutler-Hammer Mfg. Co., Milwaukee, Wis.

BRAKES.

(Electric.)

Electric Controller & Mfg. Co., Cleveland, O.

BRAZING.

(Custom.)

Champion Rivet Co., Cleveland, O.
National Welding & Mfg. Co., Buffalo, N. Y.

BREAKERS.

(Casting.)

Electric Controller & Mfg. Co. Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.

BREAKERS.

(Circuit.)

General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., Pittsburg, Pa.

BRICK AND CLAY.

(Fire.)

American Refractories Co., Chicago, Ill.
Ashland Fire Brick Co., Ashland, Ky.
Bickford Fire Brick Co., Curwensville, Pa.
Blackwell, Sons & Co., Ltd., Liverpool, Eng.
Clearfield Fire Brick Co., Clearfield, Pa.
Dover Fire Brick Co., Cleveland, O.
Harbison-Walker Refractories Co., Pittsburg, Pa.
Kier Fire Brick Co., Pittsburg, Pa.
Niles Fire Brick Co., Niles, O.
Ohio Fire Brick Co., Oak Hill, O.
Pyro Clay Products Co., Oak Hill, O.
Queen's Run Fire Brick Co., Lock Haven, Pa.
Stowe-Fuller Co., Cleveland, O.
Soisson, Jos., Fire Brick Co., Connellsville, Pa.
Stevens, F. B., Detroit, Mich.
Swank's Sons, Hiram, Johnstown, Pa.
Union Mining Co., Mt. Savage, Md.

BRICK.

(Coke Oven.)

Ashland Fire Brick Co., Ashland, Ky.
Harbison-Walker Refractories Co., Pittsburg, Pa.
Pyro Clay Products Co., Oak Hill, O.

BRICK.

(Fire Arch.)

Ashland Fire Brick Co., Ashland, Ky.
Harbison-Walker Refractories Co., Pittsburg, Pa.
Pyro Clay Products Co., Oak Hill, O.

BRICK.

(Fire, for Foundries.)

Ashland Fire Brick Co., Ashland, Ky.
Harbison-Walker Refractories Co., Pittsburg, Pa.

BRICK.

(Silica, Magnesia, Chrome.)

American Refractories Co., Chicago, Ill.
Harbison-Walker Refractories Co., Pittsburg, Pa.
Soisson, Jos., Fire Brick Co., Connellsville, Pa.
Stowe-Fuller Co., Cleveland, O.

BRICK.

(Stove Blast Furnace.)

Harbison-Walker Refractories Co., Pittsburg, Pa.
Union Mining Co., Mt. Savage, Md.

BRIDGES AND VIADUCTS.

(Steel.)

American Bridge Co. of New York, N. Y.
Bellefontaine Bridge & Steel Co., Bellefontaine, O.
Lackawanna Bridge Co., Buffalo, N. Y.
McClintic-Marshall Const. Co., Pittsburg, Pa.
McMyler Interstate Co., Cleveland, O.
Rochester Bridge Co., Rochester, Ind.
Russel Wheel & Fdy. Co., Detroit, Mich.
Worden-Allen Co., Chicago, Ill.

BRONZE.

(Vanadium.)

American Vanadium Co., Pittsburg, Pa.

BRUSHES.

(Dynamo.)

Cutler-Hammer Mfg. Co., Milwaukee, Wis.

BRUSHES.

(Foundry.)

Obermayer, S., Co., Cincinnati, O.

BUCKETS.

(Clam Shell or Grab.)

Andresen-Evans Co., Chicago, Ill.
McMyler Interstate Co., Cleveland, O.
Vulcan Steam Shovel Co., Toledo, O.
Wellman-Seaver-Morgan Co., Cleveland, O.

BUCKETS.

(Coal and Ore.)

Andresen-Evans Co., Chicago, Ill.
Williams Co., G. H., Cleveland, O.

BUCKETS.

(Elevator and Hoisting.)

Bartlett, C. O., & Snow Co., Cleveland, O.
Brown Hoisting Machinery Co., Cleveland, O.
Illinois Malleable Iron Co., Chicago, Ill.
Jeffrey Mfg. Co., Columbus, O.
McMyler Interstate Co., Cleveland, O.
Stephens-Adamson Mfg. Co., Aurora, Ill.
Wellman-Seaver-Morgan Co., Cleveland, O.

BUCKETS.

(Excavating.)

Andresen-Evans Co., Chicago, Ill.
Williams Co., G. H., Cleveland, O.

BULLDOZERS.

Chambersburg Engrg. Co., Chambersburg, Pa.
Cleveland Punch & Shear Wks. Co., Cleveland.
Long & Allstatter Co., Hamilton, O.

BURNERS.

(Fuel Oil.)

Rockwell Furnace Co., New York, N. Y.

BURRS.

(Rivet.)

Bettcher Mfg. Co., The, Cleveland, O.
Wrought Washer Mfg. Co., Milwaukee, Wis.

CABLEWAYS.

McClintic-Marshall Const. Co., Pittsburg, Pa.

CARS.

(Annealing, Pig Iron, Etc.)

Chase Foundry & Mfg. Co., Columbus, O.
Whiting Foundry Equipment Co., Harvey, Ill.

CARS.

(Coal, Coke and Mining.)

Jeffrey Mfg. Co., Columbus, O.
Massillon Fdy. & Machine Co., Massillon, O.
Russel Wheel & Fdy. Co., Detroit, Mich.
Wiener Co., Ernst, New York, N. Y.

CARS.

(Electrically Driven.)

Atlas Car & Mfg. Co., Cleveland, O.
Jeffrey Mfg. Co., Columbus, O.

CARS.

(Industrial.)

Atlas Car & Mfg. Co., Cleveland, O.
Chase Foundry & Mfg. Co., Columbus, O.
Russel Wheel & Fdy. Co., Detroit, Mich.
Stephens-Adamson Mfg. Co., Aurora, Ill.
Wiener Co., Ernst., New York, N. Y.
Whiting Foundry Equipment Co., Harvey, Ill.

CARS.

(Steel.)

Cambria Steel Co., Johnstown, Pa.
Russel Wheel & Fdy. Co., Detroit, Mich.

CASTINGS.

(Air Furnace Iron.)

Morgan Engineering Co., Alliance, O.

CASTINGS.

(Agricultural Implement.)

Badger Malleable Iron Wks., Milwaukee, Wis.
Benton Harbor Malleable Fdy. Co., Benton Harbor, Mich.

CASTINGS.

(Auto.)

Badger Malleable Iron Wks., Milwaukee, Wis.
Benton Harbor Malleable Fdy. Co., Benton Harbor, Mich.
Chisholm & Moore Mfg. Co., Cleveland, O.
Interstate Foundry Co., Cleveland, O.

CASTINGS.

(Brass, Bronze and Aluminum.)

Comstock-Wellman Bronze Co., Cleveland, O.
Dake Engine Co., Grand Haven, Mich.
Eynon-Evans Mfg. Co., Philadelphia, Pa.
Livermore, Homer F., Boston, Mass.
Mesta Machine Co., Pittsburg, Pa.
Morgan Engineering Co., The, Alliance, O.
Pittsburg Valve, Fdy. & Const. Co., Pittsburg.
United Engineering & Fdy. Co., Pittsburg, Pa.

CASTINGS.

(Die.)

Strong Steel Foundry Co., Buffalo, N. Y.

CASTINGS.

(Gray Iron.)

American Bridge Co. of New York, N. Y.
American Steel & Fdy. Co., Canton, O.
Barlow Foundry Co., Newark, N. J.
Birdsboro Steel Fdy. & Mch. Co., Birdsboro, Pa.
Buffalo Foundry & Machine Co., Buffalo, N. Y.
Cleveland Punch & Shear Works, Cleveland.
Covington Mch. Co., Covington, Va.
Dake Engine Co., Grand Haven, Mich.
Farrel Fdy. & Machine Co., Ansonia, Conn.
Flagg, Stanley G., & Co., Philadelphia, Pa.
Interstate Foundry Co., Cleveland, O.
Lake Erie Engineering Works, Buffalo, N. Y.
Massillon Fdy. & Machine Co., Massillon, O.
Massillon Iron & Steel Co., Massillon, O.
Mesta Machine Co., Pittsburg, Pa.
Morgan Engineering Co., The, Alliance, O.
National Foundry Co., Erie, Pa.
National Roll & Foundry Co., Avonmore, Pa.
Ross-Meehan Foundry Co., Chattanooga, Tenn.
Russel Wheel & Fdy. Co., Detroit, Mich.
Shelby Foundry Co., Shelby, O.
Standard Engineering Co., Ellwood City, Pa.
Taylor & Boggis Foundry Co., Cleveland, O.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
Union Foundry & Machine Co., Pittsburg, Pa.
U. S. Cast Iron Pipe & Fdy. Co., New York.
Urick Fdy. Co., Erie, Pa.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.
Youngstown Fdy. & Mch. Co., Youngstown, O.

CASTINGS.

(Gray Iron, Car and Locomotive.)

Buffalo Fdy. & Mach. Co., Buffalo, N. Y.
Johnston & Jennings Co., Cleveland, O.
Lake Erie Engineering Works, Buffalo, N. Y.
Morgan Engineering Co., The, Alliance, O.
National Foundry Co., Erie, Pa.
Ross-Meehan Foundry Co., Chattanooga, Tenn.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
United Engineering & Fdy. Co., Pittsburg, Pa.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.

CASTINGS.

(Gray Iron Machinery.)

Interstate Foundry Co., Cleveland, O.
Johnston & Jennings Co., Cleveland, O.
Morgan Engineering Co., The, Alliance, O.
Taylor & Boggis Foundry Co., Cleveland, O.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.

CASTINGS.

(Hard Iron.)

Johnston & Jennings Co., Cleveland, O.

CASTINGS.

(Light Gray Iron.)

Taylor & Boggis Foundry Co., Cleveland, O.

CASTINGS.

(Malleable.)

Acme Steel & Malleable Iron Wks., Buffalo, N. Y.
Badger Malleable Iron Wks., Milwaukee, Wis.
Barlow Foundry Co., Newark, N. J.
Belle City Malleable Iron Co., Racine, Wis.
Benton Harbor Malleable Fdy. Co., Benton Harbor, Mich.
Chisholm & Moore Mfg. Co., Cleveland, O.
Dayton Malleable Iron Co., Dayton, O.
Erie Malleable Iron Co., Erie, Pa.
Flagg, Stanley G., & Co., Philadelphia, Pa.

CASTINGS—(Continued.)
(Malleable.)

Globe Malleable Iron & Steel Co., Syracuse, N. Y.
Grand Rapids Mall. Wks., Grand Rapids, Mich.
Illinois Malleable Iron Co., Chicago, Ill.
Jeffrey Mfg. Co., Columbus, O.
Lakeside Malleable Castings Co., Racine, Wis.
Livermore, Homer F., Boston, Mass.
Missouri Malleable Iron Co., E. St. Louis, Ill.
Moline Malleable Iron Co., St. Charles, Ill.
National Malleable Castings Co., Cleveland, O.
Northwestern Mall. Iron Co., Milwaukee, Wis.
Ohio Malleable Iron Co., Columbus, O.
Pratt & Letchworth Co., Buffalo, N. Y.
Ross-Meehan Foundry Co., Chattanooga, Tenn.
Standard Malleable Iron Co., Muskegon, Mich.
Union Malleable Iron Co., East Moline, Ill.
Wisconsin Malleable Iron Co., Milwaukee, Wis.

CASTINGS.
(Malleable, Car and Locomotive.)

Badger Malleable Iron Wks., Milwaukee, Wis.
Dayton Malleable Iron Co., Dayton, O.
Jeffrey Mfg. Co., Columbus, O.
Lakeside Malleable Castings Co., Racine, Wis.
Missouri Malleable Iron Co., E. St. Louis, Mo.
Northwestern Mall. Iron Co., Milwaukee, Wis.
Pratt & Letchworth Co., Buffalo, N. Y.
Ross-Meehan Foundry Co., Chattanooga, Tenn.
Union Malleable Iron Co., East Moline, Ill.

CASTINGS.
(Manganese Steel.)

Columbia Steel Co., Portland, Ore.
Taylor Iron & Steel Co., High Bridge, N. J.

CASTINGS.
(Open-Hearth Steel.)

Columbia Steel Co., Portland, Ore.

CASTINGS.
(Semi-Steel.)

Covington Mch. Co., Covington, Va.
Flagg, Stanley G., & Co., Philadelphia, Pa.
Lake Erie Engineering Works, Buffalo, N. Y.
Mesta Machine Co., Pittsburg, Pa.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
United Engineering & Fdy. Co., Pittsburg, Pa.

CASTINGS.
(Steel.)

Acme Steel & Mall. Iron Wks., Buffalo, N. Y.
Birdsboro Steel Fdy. & Mch. Co., Birdsboro, Pa.
Bucyrus Steel Casting Co., Bucyrus, O.
Columbia Steel Co., Portland, Ore.
Farrell-Cheek Steel Fdy. Co., Sandusky, O.
Flagg, Stanley G., & Co., Philadelphia, Pa.
Hubbard Steel Foundry Co., E. Chicago, Ind.
Livermore, Homer F., Boston, Mass.
Mackintosh, Hemphill & Co., Pittsburg, Pa.
Mesta Machine Co., Pittsburg, Pa.
National Foundry Co., Erie, Pa.
Otis Steel Co., Ltd., Cleveland, O.
Pratt & Letchworth Co., Buffalo, N. Y.
Racine Steel Castings Co., Racine, Wis.
Riverside Steel Casting Co., Newark, N. J.
Russell Wheel & Fdy. Co., Detroit, Mich.
Sharon Foundry Co., Sharon, Pa.
Strong Steel Foundry Co., Buffalo, N. Y.
Taylor Iron & Steel Co., High Bridge, N. J.
United Engineering & Fdy. Co., Pittsburg, Pa.
Wellman-Seaver-Morgan Co., Cleveland, O.
West Steel Casting Co., Cleveland, O.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.
Youngstown Fdy. & Mch. Co., Youngstown, O.

CASTINGS.
(Steel, Car and Locomotive.)

Bucyrus Steel Casting Co., Bucyrus, O.
Mesta Machine Co., Pittsburg, Pa.
National Foundry Co., Erie, Pa.
Otis Steel Co., Ltd., Cleveland, O.
Pratt & Letchworth Co., Buffalo, N. Y.
Riverside Steel Casting Co., Newark, N. J.
Wellman-Seaver-Morgan Co., Cleveland, O.
West Steel Casting Co., Cleveland, O.

CASTINGS.
(Steel, Converter.)

Columbia Steel Co., Portland, Ore.
Farrel-Cheek Steel Fdy. Co., Sandusky, O.
West Steel Casting Co., The, Cleveland, O.

CASTINGS.
(Steel Crucible.)

Empire Foundry Co., New Brunswick, N. J.
Racine Steel Castings Co., Racine, Wis.
Riverside Steel Casting Co., Newark, N. J.
Strong Steel Foundry Co., Buffalo, N. Y.
West Steel Casting Co., The, Cleveland, O.

CASTINGS.
(Steel, Electrical.)

Strong Steel Foundry Co., Buffalo, N. Y.
West Steel Casting Co., Cleveland, O.

CASTINGS.
(Steel, Special.)

Taylor Iron & Steel Co., High Bridge, N. J.

CASTINGS.
(Stove Plate.)

Interstate Foundry Co., Cleveland, O.
Taylor & Boggis Foundry Co., Cleveland, O.

CASTINGS.
(Vanadium.)

American Vanadium Co., Pittsburg, Pa.
Mesta Machine Co., Pittsburg, Pa.
Riverside Steel Casting Co., Newark, N. J.
Strong Steel Foundry Co., Buffalo, N. Y.

CEMENT.

American Refractories Co., Chicago, Ill.
Universal Portland Cement Co., Chicago, Ill.

CHAIN.
(Draw.)

Taylor Iron & Steel Co., High Bridge, N. J.

CHAIN DRIVES.
(Detachable.)

Moline Malleable Iron Co., St. Charles, Ill.

CHAINS.

Jones & Laughlin Steel Co., Pittsburg, Pa.
Morse Chain Co., Ithaca, N. Y.
Steel Car Forge Co., Pittsburg, Pa.

CHAPLETS.

Champion Machine & Forging Co., Cleveland, O.
Obermayer, S., Co., Cincinnati, O.

CHARCOAL.

Hillman, J. H., & Son, Pittsburg, Pa.
Obermayer, S., Co., Cincinnati, O.

CHEMICALS.
(General.)

General Chemical Co., Cleveland, O.

CHEMISTS.
(Analytical.)

Dover Laboratory, Dover, N. J.

CLAMPS.

Starrett, L. S., Co., Athol, Mass.

CLAY.
(Fire, Ground.)

Pyro Clay Products Co., Oak Hill, O.
Union Mining Co., Mt. Savage, Md.

CLUTCHES.

Brown Hoisting Machinery Co., Cleveland, O.
Cincinnati Iron & Steel Co., Cincinnati, O.
Dodge Mfg. Co., Mishawaka, Ind.
Farrel Fdy. & Machine Co., Ansonia, Conn.

CLUTCHES.
(Induction.)

Wheeling Mold & Fdy. Co., Wheeling, W. Va.

CLUTCHES.
(Magnetic.)

Cutler-Hammer Clutch Co., Milwaukee, Wis.

COAL AND COKE.

Addy, Matthew, & Co., Cincinnati, O.
Baird & West, Detroit, Mich.
Bessemer Coke Co., Pittsburg, Pa.
Bourne-Fuller Co., Cleveland, O.
Columbus Iron & Steel Co., Columbus, O.
Debevoise-Anderson Co., New York City.
DeCamp Bros. & Yule Iron, Coal & Coke Co., St. Louis, Mo.
Eaton, Rhodes & Co., Cincinnati, O.
Hanna, M. A., & Co., Cleveland, O.
Hickman, Williams & Co., Chicago, Ill.
Hillman, J. H., & Son, Pittsburg, Pa.
La Belle Iron Works Co., Steubenville, O.
McKeefrey & Co., Leetonia, O.
Mohr, J. J., & Son, Philadelphia, Pa.
Mudge & Co., Edmund W., Pittsburg, Pa.
Pocahontas Coke Co., Cincinnati, O.
Rogers, Brown & Co., Cincinnati, O.
Squier, Ed. E., Co., St. Louis, Mo.
Stewart Iron Co., Ltd., Cleveland, O.
Tennessee Coal, Iron &R.R. Co., B'rm'g'm., Ala.
Walter-Wallingford & Co., Cincinnati, O.
Washington Coal & Coke Co., Pittsburg, Pa.

COCKS.
(Gage.)

Jenkins Bros., New York City.

COILS.
(Pipe.)

Pittsburg Valve. Fdy. & Const. Co., Pittsburg.

COKE.

Banning, Cooper & Co., Ltd., Pittsburg, Pa.
National Fuel Co., Uniontown, Pa.
Snyder & Co., W. P., Pittsburg, Pa.

COKE PUSHERS.

Koppers, H., Joliet, Ill.

COMPOUND.
(Core.)

Obermayer, S., Co., Cincinnati, O.

COMPRESSORS.
(Air.)

American Air Compressor Wks., New York.
American Compressor & Pump Co., Baltimore.
Baird Machinery Co., Pittsburg, Pa.
Cameron Steam Pump Wks., New York.
Dean Bros. Steam Pump Wks., Indianapolis, Ind.
Deming Co., Salem, O.
Eynon-Evans Mfg. Co., Philadelphia, Pa.
General Electric Co., Schenectady, N. Y.
Independent Pneumatic Tool Co., Chicago, Ill.
McGowan, J. H., Co., Cincinnati, O.
Mesta Machine Co., Pittsburg, Pa.
Norwalk Iron Works Co., So. Norwalk, Conn.
Pfannmueller Engineering Co., Chicago, Ill.
Ryerson, Jos. T., & Son, Chicago, Ill.
Shaw-Kendall Engineering Co., Toledo, O.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.

COMPRESSORS.
(Gas.)

Norwalk Iron Works Co., So. Norwalk, Conn.

CONDENSERS.
(Steam.)

Cameron Steam Pump Wks., New York.
Cooper, C. & G., Co., Mt. Vernon, O.
Dean Bros. Steam Pump Wks., Indianapolis, Ind.
Eynon-Evans Mfg. Co., Philadelphia, Pa.
McGowan, J. H., Co., Cincinnati, O.
Mesta Machine Co., Pittsburg, Pa.
Prescott Steam Pump Co., Milwaukee, Wis.
Southwark Fdy. & Mch. Co., Philadelphia, Pa.

CONSTRUCTION.
(By-Products Coke Ovens.)

Koppers, H., Joliet, Ill.

CONSTRUCTION.
(Concrete.)

Kratzer, W. N., & Co., Pittsburg, Pa.

CONSTRUCTION.
(Steel and Iron.)

American Bridge Co. of New York, N. Y.
Bellefontaine Bridge & Steel Co., Bellefontaine, O.
Kratzer, W. N., & Co., Pittsburg, Pa.
McAllister-Byrne Construction Co., Girard, O.
McClintic-Marshall Const. Co., Pittsburg, Pa.
McMyler Interstate Co., Cleveland, O.
Riter-Conley Mfg. Co., Pittsburg, Pa.
Sharon Boiler Works, Sharon, Pa.
Struthers-Wells Co., Warren, Pa.

CONSTRUCTION.
(Steel Plate.)

Canton Boiler & Engrg. Co., Canton, O.

CONTRACTORS.
(Piping.)

Pittsburg Piping Equipment Co., Pittsburg, Pa.

CONTROLLERS.

Allen, John F., Co., New York City.
Alliance Machine Co., Alliance, O.
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Electric Controller & Mfg. Co., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Morgan Engineering Co., Alliance, O.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.
Westinghouse Elec. & Mfg. Co., Pittsburg, Pa.

CONTROLLERS.
(Boiler Feed and Open Heater Feed.)

Strong, Carlisle & Hammond Co., Cleveland, O.

CONTROLLERS.
(Crane.)

Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Electric Controller & Mfg. Co., Cleveland, O.

CONTROLLERS.
(Electric.)

Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Electric Controller & Mfg. Co., Cleveland, O.

CONVEYORS.

Bartlett, C. O., & Snow Co., Cleveland, O.
Dodge Mfg. Co., Mishawaka, Ind.
Jeffrey Mfg. Co., Columbus, O.
McMyler Interstate Co., Cleveland, O.
Stephens-Adamson Mfg. Co., Aurora, Ill.

COTTERS.

Hindly Mfg. Co., The, Valley Falls, R. I.

COUNTERSHAFTS.

Andresen-Evans Co., Chicago, Ill.
Norton Co., Worcester, Mass.

COUNTERSHAFTS.
(Variable Speed.)

Norton Co., Worcester, Mass.

COUPLINGS.

Bliss Co., E. W., Brooklyn, N. Y.
Bradley, C. C. & Son, Syracuse, N. Y.
Dodge Mfg. Co., Mishawaka, Ind.
Electric Controller & Mfg. Co., Cleveland, O.
Independent Pneumatic Tool Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburg, Pa.
National Tube Co., Pittsburg, Pa.

COUPLINGS.
(Air Hose.)

Independent Pneumatic Tool Co., Chicago, Ill.

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COUPLINGS.
(Flexible.)

Electric Controller & Mfg. Co., Cleveland, O.

CRANE WHEELS.
(Manganese Steel.)

Taylor Iron & Steel Co., High Bridge, N. J.

CRANES.
(Charging.)

Alliance Machine Co., Alliance, O.
Cleveland Crane & Engrg. Co., Wickliffe, O.
Morgan Engineering Co., Alliance, O.
Toledo Bridge & Crane Co., Toledo, O.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES.
(Electric Traveling.)

Alliance Machine Co., Alliance, O.
Brown Hoisting Machinery Co., Cleveland, O.
Browning, Victor R., Co., Cleveland, O.
Chisholm & Moore Mfg. Co., Cleveland, O.
Cincinnati Iron & Steel Co., Cincinnati, O.
Cleveland Crane & Engrg. Co., Wickliffe, O.
Industrial Works, Bay City, Mich.
Mackintosh-Hemphill & Co., Pittsburg, Pa.
Manning, Maxwell & Moore, New York City.
McMyler Interstate Co., Cleveland, O.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., New York, N. Y.
Northern Engineering Works, Detroit, Mich.
Ridgway, Craig & Son, Coatesville, Pa.
Shaw Electric Crane Co., New York, N. Y.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.
Toledo Bridge & Crane Co., Toledo, O.
Wellman-Seaver-Morgan Co., Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.
Wood, R. D., & Co., Philadelphia, Pa.

CRANES.
(Floor.)

Cincinnati Iron & Steel Co., Cincinnati, O.

CRANES.
(Gantry.)

Alliance Machine Co., Alliance, O.
Brown Hoisting Machinery Co., Cleveland, O.
Cleveland Crane & Engrg. Co., Wickliffe, O.
McMyler Interstate Co., Cleveland, O.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., New York, N. Y.
Russel Wheel & Fdy. Co., Detroit, Mich.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.
Toledo Bridge & Crane Co., Toledo, O.
Whiting Foundry Equipment Co., Harvey, Ill.
Wood, R. D., & Co., Philadelphia, Pa.

CRANES.
(Hand Traveling.)

Alliance Machine Co., Alliance, O.
Brown Hoisting Machinery Co., Cleveland, O.
Browning, Victor R., Co., Cleveland, O.
Chisholm & Moore Mfg. Co., Cleveland, O.
Cincinnati Iron & Steel Co., Cincinnati, O.
Cleveland Crane & Engrg. Co., Wickliffe, O.
Euclid Crane & Hoist Co., Euclid, O.
Niles-Bement-Pond Co., New York, N. Y.
Northern Engrg. Works, Detroit, Mich.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.
Toledo Bridge & Crane Co., Toledo, O.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES.
(Hydraulic.)

Alliance Machine Co., Alliance, O.
Cincinnati Iron & Steel Co., Cincinnati, O.
Morgan Engineering Co., Alliance, O.
Toledo Bridge & Crane Co., Toledo, O.
Wellman-Seaver-Morgan Co., Cleveland, O.
Whiting Fdy. Equipment Co., Harvey, Ill.

CRANES.
(Jib.)

Alliance Machine Co., Alliance, O.
Brown Hoisting Machinery Co., Cleveland, O.
Browning, Victor R., Co., Cleveland, O.
Cleveland Crane & Engrg. Co., Wickliffe, O.
Chisholm & Moore Mfg. Co., Cleveland, O.
Euclid Crane & Hoist Co., Euclid, O.
Industrial Works, Bay City, Mich.
McMyler Interstate Co., Cleveland, O.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., New York City.
Northern Engrg. Works, Detroit, Mich.
Ridgway, Craig & Son, Coatesville, Pa.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.
Toledo Bridge & Crane Co., Toledo, O.
United Engineering & Fdy. Co., Pittsburg, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.
Wood, R. D., & Co., Philadelphia, Pa.

CRANES.
(Locomotive.)

Brown Hoisting Machinery Co., Cleveland, O.
Cleveland Crane & Engrg. Co., Wickliffe, O.
Industrial Works, Bay City, Mich.
McMyler Interstate Co., Cleveland, O.
Morgan Engineering Co., Alliance, O.
Northern Engrg. Works, Detroit, Mich.
Vulcan Steam Shovel Co., Toledo, O.
Wellman-Seaver-Morgan Co., Cleveland, O.
Whiting Fdy. Equipment Co., Harvey, Ill.

CRANES.
(Pneumatic.)

Brown Hoisting Machinery Co., Cleveland, O.
Detroit Hoist & Machine Co., Detroit, Mich.
Industrial Works, Bay City, Mich.
Northern Engineering Works, Detroit, Mich.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.
Toledo Bridge & Crane Co., Toledo, O.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES.
(Special.)

Alliance Machine Co., Alliance, O.
Cleveland Crane & Engrg. Co., Wickliffe, O.
Morgan Engrg. Co., Alliance, O.
Niles-Bement-Pond Co., New York City.
Northern Engineering Works, Detroit, Mich.
Shaw Electric Crane Co., New York, N. Y.
Toledo Bridge & Crane Co., Toledo, O.
United Engineering & Fdy. Co., Pittsburg, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES.
(Steam and Pneumatic, Wire Mills.)

Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

CRAYONS.
(Metal Marking.)

Korn, Wm., 120-R Centre St., New York City.

CRUCIBLES.

Dixon, Joseph, Crucible Co., Jersey City, N. J.
Obermayer, S., Co., Cincinnati, O.

CUPOLAS.

Northern Engineering Works, Detroit, Mich.
Paxson, J. W., Co., Philadelphia, Pa.
Riter-Conley Mfg. Co., Pittsburg, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.

CUPRO.
(Vanadium.)

American Vanadium Co., Pittsburg, Pa.

CUTTERS.

Landis Tool Co., Waynesboro, Pa.
National Machinery Co., Tiffin, O.
Standard Engineering Co., Ellwood City, Pa.
Ward & Sons, Edgar T., Boston, Mass.

CUTTERS.
(Sprue.)

Bliss, E. W., Co., Brooklyn, N. Y.
Shuster Co., F. B., New Haven, Conn.
Toledo Machine & Tool Co., Toledo, O.
Waterbury Farrel Fdy. & Mch. Co., Wat'r'by, Ct.

CUTTING.
(Oxhydric Process.)

American Oxhydric Co., The, Milwaukee, Wis.

CYLINDERS.
(Vanadium.)

American Vanadium Co., Pittsburg, Pa.

DAUBING.
(Cupola.)

Harbison-Walker Refractories Co., Pittsburg, Pa.
Obermayer, S., Co., Cincinnati, O.

DERRICKS.
(Revolving.)

Northern Engineering Works, Detroit, Mich.
Williams Co., G. H., Cleveland, O.

DIES.

Cleveland Punch & Shear Wks. Co., Cleveland.
Jones & Lamson Machine Co., Springfield, Vt.
Long & Allstatter Co., Hamilton, O.
Ryerson, Joseph T., & Son, Chicago, Ill.
Toledo Machine & Tool Co., Toledo, O.

DIES.
(Forging.)

Mesta Machine Co., Pittsburg, Pa.

DIE-PLATES AND WORLDES.
(Steel, Wire Mills.)

Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

DREDGES.

Thew Automatic Shovel Co., Lorain, O.
Vulcan Steam Shovel Co., Toledo, O.

DRESSERS.
(Emery Wheel.)

Norton Co., Worcester, Mass.

DRILLS.

Baird Machinery Co., Pittsburg, Pa.
Baker Bros., Toledo, O.
Baush Machine Tool Co., Springfield, Mass.
Cincinnati Bickford Tool Co., Cincinnati, O.
Cincinnati Iron & Steel Co., Cincinnati, O.
McCabe, J. J., New York City.
Motch & Merryweather Mchy. Co., Cleveland, O.
Niles-Bement-Pond Co., New York City.
Ryerson, Joseph T., & Son, Chicago, Ill.
Vandyck-Churchill Co., New York City.

DRILLS.
(Electrical.)

Independent Pneumatic Tool Co., Chicago, Ill.

DRILLS.
(Multiple.)

Baush Machine Tool Co., Springfield, Mass.

DRILLS.
(Pneumatic.)

Allen, John F., Co., New York City.
Cleveland Pneumatic Tool Co., Cleveland, O.
Ryerson, Joseph T., & Son, Chicago, Ill.

DRILLS.
(Portable.)

Carnegie Steel Co., Pittsburg, Pa.
Cincinnati Bickford Tool Co., Cincinnati, O.
Cincinnati Electrical Tool Co., Cincinnati, O.

DRILLS.
(Radial.)

Baush Machine Tool Co., Springfield, Mass.

DRILLS.
(Sensitive and Upright.)

Cincinnati Iron & Steel Co., Cincinnati, O.

DRILLS.
(Twist.)

Cleveland Twist Drill Co., Cleveland, O.
Ryerson, Joseph T., & Son, Chicago, Ill.
Ward & Sons, Edgar T., Boston, Mass.

DRIVERS.
(Pile.)

Industrial Works, Bay City, Mich.
McMyler Interstate Co., Cleveland, O.

DYNAMOS.

General Electric Co., Schnectady, N. Y.
Westinghouse Elec. & Mfg. Co., Pittsburg, Pa.

ELEVATORS.

Dodge Mfg. Co., Mishawaka, Ind.
Jeffrey Mfg. Co., Columbus, O.
Ridgway, Craig, & Son, Coatesville, Pa.
Stephens-Adamson Mfg. Co., Aurora, Ill.

ENGINEERS AND CONTRACTORS.

American Bridge Co. of New York, N. Y.
Bellefontaine Bridge & Steel Co., Bellefontaine, O.
Blair Engineering Co., New York, N. Y.
Bucyrus Steel Casting Co., Bucyrus, O.
Eynon-Evans Mfg. Co., Philadelphia, Pa.
Hagan, Geo. J., Pittsburg, Pa.
Jeffrey Mfg. Co., Columbus, O.
Kennedy, Julian, Pittsburg, Pa.
Kennedy, Walter, Pittsburg, Pa.
Koppers, H., Joliet, Ill.
Lackawanna Bridge Co., Buffalo, N. Y.
Ladd & Baker, Philadelphia, Pa.
Lake Erie Engineering Works, Buffalo, N. Y.
Laughlin, Alex., & Co., Pittsburg, Pa.
McClintic-Marshall Const. Co., Pittsburg, Pa.
McClure, Geo. W., Son & Co., Pittsburg, Pa.
McKee, Arthur G., Cleveland, O.
Morgan Engineering Co., Alliance, O.
Osborn Engineering Co., Cleveland, O.
Pittsburg Valve, Fdy. & Const. Co., Pittsburg.
Riter-Conley Mfg. Co., Pittsburg, Pa.
Russel Wheel & Fdy. Co., Detroit, Mich.
Seaver, John W., Cleveland, O.
Shaw-Kendall Engineering Co., Toledo, O.
Smythe, S. R., Co., Pittsburg, Pa.
Stephens-Adamson Mfg. Co., Aurora, Ill.
Swindell, Wm., & Bros., Pittsburg, Pa.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.
Union Foundry & Machine Co., Pittsburg, Pa.
United Engineering & Fdy. Co., Pittsburg, Pa.
Wellman-Seaver-Morgan Co., Cleveland, O.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.
Worden-Allen Co., Chicago, Ill.
Wright-Hall Engineering Co., Chicago, Ill.

ENGINEERS AND CONTRACTORS.
(By-Products Coke Ovens.)

Koppers, H., Joliet, Ill.

ENGINEERS.
(Foundry.)

Pangborn, Thomas W., Company, New York.
Wright-Hall Engineering Co., Chicago, Ill.

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ENGINES.
(Automatic.)
American Blower Co., Detroit, Mich.
Russell Engine Co., Massillon, O.

ENGINES.
(Blowing.)
Pfannmueller Engineering Co., Chicago, Ill.
Russell Engine Co., Massillon, O.
Tod Co., Wm., Youngstown, O.

ENGINES.
(Gas and Gasoline.)
Buckeye Engine Co., Salem, O.
Cooper, C. & G., Co., Mt. Vernon, O.
Mesta Machine Co., Pittsburg, Pa.
Struthers-Wells Co., Warren, Pa.
Tod Co., Wm., Youngstown, O.

ENGINES.
(Hoisting.)
Brown Hoisting Machinery Co., Cleveland, O.
Browning, Victor R., Co., Cleveland, O.
Cooper, C. & G., Co., Mt. Vernon, O.
Dake Engine Co., Grand Haven, Mich.
Detroit Hoist & Machine Co., Detroit, Mich.
Mesta Machine Co., Pittsburg, Pa.
Russel Wheel & Fdy. Co., Detroit, Mich.
Vulcan Iron Works, Wilkesbarre, Pa.

ENGINES.
(Pneumatic.)
Dake Engine Co., Grand Haven, Mich.
Detroit Hoist & Machine Co., Detroit, Mich.

ENGINES.
(Pumping.)
Tod Co., Wm., Youngstown, O.

ENGINES.
(Steam.)
American Blower Co., Detroit, Mich.
Buckeye Engine Co., Salem, O.
Columbus Iron & Steel Co., Columbus, O.
Cooper, C. & G., Co., Mt. Vernon, O.
Dake Engine Co., Grand Haven, Mich.
Lake Erie Engineering Works, Buffalo, N. Y.
Mackintosh, Hemphill & Co., Pittsburg, Pa.
Mesta Machine Co., Pittsburg, Pa.
Pfannmueller Engineering Co., Chicago, Ill.
Providence Engineering Wks., Providence, R. I.
Russell Engine Co., Massillon, O.
Southwark Fdy. & Mch. Co., Philadelphia, Pa.
Struthers-Wells Co., Warren, Pa.
Tod Co., Wm., Youngstown, O.
Wellman-Seaver-Morgan Co., Cleveland, O.

EQUIPMENT.
(By-Products Coke Ovens.)
Koppers, H., Joliet, Ill.

EQUIPMENT.
(Rolling Mill.)
American Roll & Foundry Co., Canton, O.
Morgan Construction Co., Worcester, Mass.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.

EQUIPMENT.
(Welded Chain, Wire and Wire Nail Mills—Complete.)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

EXTRACTORS.
(Steam or Oil.)
Strong, Carlisle & Hammond Co., Cleveland, O.

EYE AND ANGLE BENDERS.
(Hand Machines.)
Hinman, D. A., & Co., Sandwich, Ill.

FACINGS.
(Foundry.)
Dixon, Joseph, Crucible Co., Jersey City, N. J.
Obermayer, S., Co., Cincinnati, O.
Stevens, F. B., Detroit, Mich.

FANS.
(Exhaust and Ventilating.)
American Blower Co., Detroit, Mich.
Sirocco Engineering Co., Detroit, Mich.

FASTENERS.
(Belt.)
Kenehan Belt Fastener Co., Cleveland, O.

FASTENINGS.
(Rail.)
Cambria Steel Co., Johnstown, Pa.

FERRO-MANGANESE.
Addy, Matthew & Co., Cincinnati, O.
Blackwell & Sons, Ltd., Liverpool, Eng.
Mohr, J. J., & Son, Philadelphia, Pa.
Obermayer, S., Co., Cincinnati, O.
Rogers, Brown & Co., Cincinnati, O.

FERRO-SILICON.
Addy, Matthew & Co., Cincinnati, O.
Blackwell & Sons Co., Ltd., Liverpool, Eng.
Mohr, J. J., & Son, Philadelphia, Pa.
Obermayer, S., Co., Cincinnati, O.
Rogers, Brown & Co., Cincinnati, O.
Tennessee Coal, Iron&R.R. Co., Brm'g'ham. Ala.

FERRO.
(Vanadium.)
American Vanadium Co., Pittsburg, Pa.

FILES.
Barnett, G. & H., Co., Philadelphia, Pa.
Nicholson File Co., Providence, R. I.

FILLET.
(Leather and Wood.)
Obermayer, S., Co., Cincinnati, O.

FITTINGS.
(Electric Crane.)
Electric Controller & Mfg. Co., Cleveland, O.

FITTINGS.
(Flanged—Cast Iron.)
Massillon Iron & Steel Co., Massillon, O.

FITTINGS.
(Pipe.)
Flagg, Stanley G., & Co., Philadelphia, Pa.
Illinois Malleable Iron Co., Chicago, Ill.
National Tube Co., Pittsburg, Pa.
Pittsburg Piping & Equipment Co., Pittsburg.
Pittsburg Valve, Foundry & Construction Co., Pittsburg, Pa.
United Engineering & Fdy. Co., Pittsburg, Pa.

FITTINGS.
(Pipe—Cast Iron.)
Massillon Iron & Steel Co., Massillon, O.

FLANGES.
Hubbard Steel Foundry Co., East Chicago, Ind.
National Tube Co., Pittsburg, Pa.
Ryerson, Jos. T., & Son, Chicago, Ill.

FLOORING.
(Bridge.)
Youngstown Iron & Steel Co., Youngstown, O.

FLOUR.
(Foundry.)
Obermayer, S., Co., Cincinnati, O.

FLUOR-SPAR.
Addy, Matthew & Co., Cincinnati, O.
Rogers, Brown & Co., Cincinnati, O.

FLY WHEELS.
Covington Mach. Co., Covington, Va.
Jones & Laughlin Steel Co., Pittsburg, Pa.

FORGES.
Chicago Flexible Shaft Co., Chicago, Ill.
Rockwell Furnace Co., New York, N. Y.

FORGINGS.
American Iron & Steel Mfg. Co., Lebanon, Pa.
Bliss Co., E. W., Brooklyn, N. Y.
Bliss & Laughlin, Inc., Harvey, Ill.
Carnegie Steel Co., Pittsburg, Pa.
Champion Machine & Forging Co., Cleveland.
Cleveland City Forge & Iron Co., Cleveland.
Firth-Sterling Steel Co., McKeesport, Pa.
Ingalls-Shepard Forging Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburg, Pa.
Mesta Machine Co., Pittsburg, Pa.
Otis Steel Co., Ltd., Cleveland, O.
Steel Car Forge Co., Pittsburg, Pa.
Sundberg, Kropp & Co., Chicago, Ill.
Toledo Machine & Tool Co., Toledo, O.
Union Mfg. & Drop Forge Co., Providence, R. I.

FORGINGS.
(Auto.)
General Drop Forge Co., Buffalo, N. Y.
Sundberg, Kropp & Co., Chicago, Ill.

FORGINGS.
(Copper and Alloy Steel.)
General Drop Forge Co., Buffalo, N. Y.
Wyman & Gordon Co., Cleveland, O., and Worcester, Mass.

FORGINGS.
(Car and Locomotive.)
American Iron & Steel Mfg. Co. Lebanon, Pa.
Cleveland City Forge & Iron Co., Cleveland, O.
General Drop Forge Co., Buffalo, N. Y.
Ingalls-Shepard Forging Co., Chicago, Ill.
Oliver Iron & Steel Co., Pittsburg, Pa.
Steel Car Forge Co., Pittsburg, Pa.
Toledo Machine & Tool Co., Toledo, O.

FORGINGS.
(Drop.)
Anderson Forge & Machine Co., Detroit, Mich.
Champion Machine & Forging Co., Cleveland, O.
Consolidated Mfg. Co., Toledo, O.
General Drop Forge Co., Buffalo, N. Y.
Ingalls-Shepard Forging Co., Chicago, Ill.
Oliver Iron & Steel Co., Pittsburg, Pa.
Steel Car Forge Co., Pittsburg, Pa.
Union Mfg. & Drop Forge Co., Providence, R.I.
Wyman & Gordon Co., Cleveland, O., and Worcester, Mass.

FORGINGS.
(Light and Medium.)
General Drop Forge Co., Buffalo, N. Y.
Sundberg, Kropp & Co., Chicago, Ill.

FORGINGS.
(Vanadium.)
American Vanadium Co., Pittsburg, Pa.

FORKS AND HOES.
American Fork & Hoe Co., Cleveland, O.

FOUNDRY EQUIPMENT AND SUPPLIES.
(Iron and Brass.)
Obermayer, S., Co., Cincinnati, O.
Pangborn, Thomas W., Co., New York City.
Paxson, J. W., Co., Philadelphia, Pa.
Sly Mfg. Co., W. W., Cleveland, O.
Stevens, F. B., Detroit, Mich.

FURNACES.
(Annealing.)
Chicago Flexible Shaft Co., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Hagen, George J., Pittsburg, Pa.
Holcroft & Co., Detroit, Mich.
McClure, Son & Co., G. W., Pittsburg, Pa.
Rockwell Furnace Co., New York, N. Y.
Rockwell, W. S., Co., New York City.
Strong, Carlisle & Hammond Co., Cleveland, O.
Swindell & Bros., Wm., Pittsburg, Pa.

FURNACES.
(Blast.)
Canton Boiler & Engrg. Co., Canton, O.
Kennedy, Julian, Pittsburg, Pa.
Kennedy, Walter, Pittsburg, Pa.
Ladd & Baker, Philadelphia, Pa.
Lake Erie Engineering Works, Buffalo, N. Y.
Mackintosh, Hemphill & Co., Pittsburg, Pa.
McKee, Arthur G., Cleveland, O.
McClure, Son & Co., G. W., Pittsburg, Pa.
Mesta Machine Co., Pittsburg, Pa.
Morgan Engineering Co., Alliance, O.
Pittsburg Valve, Fdy., & Const. Co., Pittsburg.
Riter-Conley Mfg. Co., Pittsburg, Pa.
Sharon Boiler Works, Sharon, Pa.
Smythe Co., S. R., House Bldg., Pittsburg, Pa.
Southwark Fdy. & Mach. Co., Philadelphia, Pa.
Strong, Carlisle & Hammond Co., Cleveland, O.
Swindell & Bros., Wm., Pittsburg, Pa.
Wellman-Seaver-Morgan Co., Cleveland, O.

FURNACES.
(Brass and Copper Melting.)
Chicago Flexible Shaft Co., Chicago, Ill.
Hawley Down-Draft Furnace Co., Chicago, Ill.
Rockwell Furnace Co., New York City.
Rockwell, W. S., Co., New York City.
Strong, Carlisle & Hammond Co., Cleveland, O.
Swindell & Bros., Wm., Pittsburg, Pa.

FURNACES.
(Brazing.)
Chicago Flexible Shaft Co., Chicago, Ill.
Strong, Carlisle & Hammond Co., Cleveland, O.

FURNACES.
(Crucible.)
Chicago Flexible Shaft Co., Chicago, Ill.
Hawley Down-Draft Furnace Co., Chicago, Ill.
Holcroft & Co., Detroit, Mich.
Laughlin & Co., Alex., Pittsburg, Pa.
Rockwell Furnace Co., New York, N. Y.
Rockwell, W. S., Co., New York City.
Strong, Carlisle & Hammond Co., Cleveland, O.
Swindell & Bros., Wm., Pittsburg, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.

FURNACES.
(Electrically Heated.)
Bristol Co., Waterbury, Conn.
Strong, Carlisle & Hammond Co., Cleveland, O.

FURNACES.
(Forging.)
Chicago Flexible Shaft Co., Chicago, Ill.
National Machinery Co., Tiffin, O.
Rockwell Furnace Co., New York City.
Strong, Carlisle & Hammond Co., Cleveland, O.

FURNACES.
(High Speed Steel.)
Chicago Flexible Shaft Co., Chicago, Ill.
Strong, Carlisle & Hammond Co., Cleveland, O.

FURNACES.
(Lead, Pot and Muffle Annealing, Wire Mills.)
Humphrey & Sons, Joliet, Ill.
Strong, Carlisle & Hammond Co., Cleveland, O.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

FURNACES.
(Melting.)
Chicago Flexible Shaft Co., Chicago, Ill.
Hawley Down-Draft Furnace Co., Chicago, Ill.
Rockwell Furnace Co., New York, N. Y.
Rockwell, W. S., Co., New York City.
Strong, Carlisle & Hammond Co., Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.

FURNACES.
(Oil and Coke Crucible.)
Chicago Flexible Shaft Co., Chicago, Ill.
Hawley Down-Draft Furnace Co., Chicago, Ill.
Strong, Carlisle & Hammond Co., Cleveland, O.

FURNACES.
(Oil, Gas or Coke, Welded Chain Factories.)
Humphrey & Sons, Joliet, Ill.
Strong, Carlisle & Hammond Co., Cleveland, O.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

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FURNACES.
(Reheating.)
Chicago Flexible Shaft Co., Chicago, Ill.
Morgan Construction Co., Worcester, Mass.
Rockwell Furnace Co., New York City.
Strong, Carlisle & Hammond Co., Cleveland, O.

FURRING.
(Metal.)
Youngstown Iron & Steel Co., Youngstown, O.

GALVANIZING.
Empire Iron & Steel Co., Niles, O.

GALVANIZING POTS.
Wilfong Iron Works Co., M. F., Philadelphia.

GASKETS.
(Copper.)
Bettcher Mfg. Co., Cleveland, O.

GAUGES.
(Recording and Steam.)
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Philadelphia, Pa.

GEARS.
Bilgram Machine Works, Philadelphia, Pa.
Boston Gear Works, Norfolk Downs, Mass.
Chicago Rawhide Mfg. Co., Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
Farrel Foundry & Mach. Co., Ansonia, Conn.
Foote Bros. Gear & Mach. Co., Chicago, Ill.
Ganschow, Wm., Co., Chicago, Ill.
Gleason Wks., Rochester, N. Y.
Horsburgh & Scott Co., Cleveland, O.
Hubbard Steel Foundry Co., East Chicago, Ind.
Mesta Machine Co., Pittsburg, Pa.
New Process Rawhide Co., Syracuse, N. Y.
Nuttall, R. D., Co., Pittsburg, Pa.
Southwark Fdy. & Mach. Co., Philadelphia, Pa.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
Union Foundry & Machine Co., Pittsburg, Pa.
United Engineering & Fdy. Co., Pittsburg, Pa.

GEARS.
(Bevel.)
Chicago Rawhide Mfg. Co., Chicago, Ill.
Mesta Machine Co., Pittsburg, Pa.
New Process Rawhide Co., Syracuse, N. Y.

GEARS.
(Cast Steel, Mach. Molded.)
Chicago Rawhide Mfg. Co., Chicago, Ill.
Mesta Machine Co., Syracuse, N. Y.
United Engineering & Fdy. Co., Pittsburg, Pa.

GEARS.
(Cut.)
Boston Gear Works, Norfolk Downs, Mass.
Chicago Rawhide Mfg. Co., Chicago, Ill.
Ganschow, Wm., Co., Chicago, Ill.
Mesta Machine Co., Pittsburg, Pa.
New Process Rawhide Co., Syracuse, N. Y.

GEARS.
(Manganese Steel.)
Taylor Iron & Steel Co., High Bridge, N. J.

GEARS.
(Rawhide.)
Boston Gear Wks., Norfolk Downs, Mass.
Chicago Rawhide Mfg. Co., Chicago, Ill.
Ganschow, Wm., Co., Chicago, Ill.
New Process Rawhide Co., Syracuse, N. Y.

GEARS.
(Swinging.)
Dake Engine Co., Grand Haven, Mich.

GEARS.
(Vanadium.)
American Vanadium Co., Pittsburg, Pa.

GENERATORS.
(Direct and Alternating.)
General Electric Co., Schenectady, N. Y.
Pfannmueller Engineering Co., Chicago, Ill.
Westinghouse Elec. & Mfg. Co., Pittsburg, Pa.

GLASSES.
(Gage Boiler.)
Strong, Carlisle & Hammond Co., Cleveland, O.

GOVERNORS.
(Pump.)
Dean Bros. Steam Pump Wks., Indianapolis, Ind.
Eynon-Evans Mfg. Co., Philadelphia, Pa.
McGowan, J. H., Co., Cincinnati, O.
Strong, Carlisle & Hammond Co., Cleveland, O.
Wood & Co., R. D., Philadelphia, Pa.

GRAPHITE.
Dixon Crucible Co., Jos., Jersey City, N. J.

GRATES.
Lake Erie Engineering Works, Buffalo, N. Y.
Vulcan Iron Works Co., Toledo, O.

GRINDERS.
(Chain Die, Welded Chain Factories.)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

GRINDERS.
(Nail Machine Knife, Wire Nail Mills.)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

GRINDERS.
(Pneumatic.)
Cleveland Pneumatic Tool Co., Cleveland, O.

GUARDS.
(Incandescent Lamp.)
McGill Mfg. Co., Valparaiso, Ind.

GUARDS.
(Portable Lamp.)
McGill Mfg. Co., Valparaiso, Ind.

HAMMERS.
(Air.)
Nazel Eng'r'g & Mach. Wks., Philadelphia, Pa.

HAMMERS.
(Belt Driven.)
Beaudry & Co., Inc., Boston, Mass.
Bradley & Son, C. C., Syracuse, N. Y.
Nazel Eng'r'g & Mach. Wks., Philadelphia, Pa.

HAMMERS.
(Drop.)
Alliance Machine Co., Alliance, O.
Bliss, E. W., Co., Brooklyn, N. Y.
Chambersburg Engrg. Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Garrison, A., Foundry Co., Pittsburg, Pa.
Massillon Fdy. & Machine Co., Massillon, O.
Merrill Bros., Brooklyn, N. Y.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., New York City.
Toledo Machine & Tool Co., Toledo, O.
United Engrg. & Fdy Co., Pittsburg, Pa.
Waterbury Farrel Fdy. & Mach. Co., Waterbury, Conn.

HAMMERS.
(Foot and Power, Welded Chain Factories.)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

HAMMERS.
(Motor Driven.)
Nazel Eng'r'g & Mach. Wks., Philadelphia, Pa.

HAMMERS.
(Pneumatic.)
Bliss Co., E. W., Brooklyn, N. Y.
Cleveland Pneumatic Tool Co., Cleveland, O.
Ryerson, Joseph T., & Son, Chicago, Ill.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.

HAMMERS.
(Power.)
Alliance Machine Co., Alliance, O.
Beaudry & Co., Inc., Boston, Mass.
Bliss Co., E. W., Brooklyn, N. Y.
Bradley & Sons, C. C., Syracuse, N. Y.
Buffalo Fdy. & Mach. Co., Buffalo, N. Y.
Cleveland Punch & Shear Works, Cleveland, O.
Massillon Fdy. & Mach. Co., Massillon, O.
Morgan Engineering Co., Alliance, O.
Nazel Eng'r'g & Mach. Wks., Philadelphia, Pa.
Toledo Mach. & Tool Co., Toledo, O.
Waterbury Farrel Fdy. & Mch. Co., Watb'ry, Ct.

HAMMERS.
(Steam.)
Alliance Machine Co., Alliance, O.
Buffalo Fdy. & Mach Co., Bufflo, N. Y.
Chambersburg Engrg. Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Massillon Fdy. & Mach. Co., Massillon, O.
Mesta Machine Co., Pittsburg, Pa.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., New York City.
Ryerson, Jos. T., & Son, Chicago, Ill.

HAMMERS.
(Steam Gravity Drop.)
Massillon Fdy. & Mach. Co., Massillon, O.

HANGERS.
Dodge Mfg. Co., Mishawaka, Ind.
Jones & Laughlin Steel Co., Pittsburg, Pa.

HEADS.
(Exhaust.)
Pittsburg Valve, Fdy. & Const. Co., Pittsburg.

HEATERS.
(Feed Water.)
Green Fuel Economizer Co., Matteawan, N. Y.
Hawley Down-Draft Furnace Co., Chicago, Ill.
McGowan Co., J. H., Cincinnati, O.
Russell Engine Co., Massillon, O.
Shaw-Kendall Engineering Co., Toledo, O.

HEATERS.
(Ladle.)
Hawley Down-Draft Furnace Co., Chicago, Ill.

HEATERS.
(Rivet.)
Chicago Flexible Shaft Co., Chicago, Ill.

HOIST HOLDERS.
Cincinnati Iron & Steel Co., Cincinnati, O.

HOISTS.
(Chain.)
Brown Hoisting Machinery Co., Cleveland, O.
Chisholm & Moore Mfg. Co., Cleveland, O.
Cleveland Crane & Engrg. Co., Wickliffe, O.
Dake Engine Co., Grand Haven, Mich.
Detroit Hoist & Machine Co., Detroit, Mich.
Northern Engineering Works, Detroit, Mich.
Ryerson, Jos. T., & Son, Chicago, Ill.

HOISTS.
(Compressed Air Geared.)
Detroit Hoist & Machine Co., Detroit, Mich.
Weir & Craig Mfg. Co., Chicago, Ill.

HOISTS.
(Electric.)
Alliance Machine Co., Alliance, O.
Brown Hoisting Machinery Co., Cleveland, O.
Browning, Victor R., Co., Cleveland, O.
Cleveland Crane & Engrg. Co., Wickliffe, O.
Euclid Crane & Hoist Co., Euclid, O.
General Electric Co., Schenectady, N. Y.
Jeffrey Mfg. Co., Columbus, O.
McMyler Interstate Co., Cleveland, O.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., New York City.
Northern Engineering Works, Detroit, Mich.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.
Sprague Electric Co., New York City.
Whiting Foundry Equipment Co., Harvey, Ill.

HOISTS.
(Pneumatic.)
Brown Hoisting Machinery Co., Cleveland, O.
Dake Engine Co., Grand Haven, Mich.
Detroit Hoist & Machine Co., Detroit, Mich.
Independent Pneumatic Tool Co., Chicago, Ill.
Northern Engineering Works, Detroit, Mich.
Ridgway, Craig & Son, Coatesville, Pa.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.
Whiting Foundry Equipment Co., Harvey, Ill.

HOOPS.
(Steel.)
American Steel & Wire Co., Cleveland, O.
Amer. Tube & Stamping Co., Bridgeport, Ct.
Bourne-Fuller Co., Cleveland, O.
Carnegie Steel Co., Pittsburg, Pa.
Jones & Laughlin Steel Co., Pittsburg, Pa.
Pittsburg Steel Co., Pittsburg, Pa.
Ryerson, Joseph T., & Son, Chicago, Ill.

HOSE.
(Pneumatic.)
Cleveland Pneumatic Tool Co., Cleveland, O.
Independent Pneumatic Tool Co., Chicago, Ill.

HYDROGEN.
American Oxhydric Co., The, Milwaukee, Wis.

INDICATORS.
(Revolution.)
Brown Instrument Co., Philadelphia, Pa.

INJECTORS.
Eynon-Evans Mfg. Co., Philadelphia, Pa.
Jenkins Bros., New York City.
Watson, N. A., Erie, Pa.

INSTRUMENTS.
(Electrical.)
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Philadelphia, Pa.

IRON.
Pittsburgh Metal Products Co., Pittsburgh, Pa., "Am. Ingot Iron."

IRON.
(Autogenous Welding.)
American Oxhydric Co., The, Milwaukee, Wis.
National Welding & Mfg. Co., Buffalo, N. Y.

IRON.
(Basic—Bessemer—Malleable.)
Addy, Matthew & Co., Cincinnati, O.
Hamilton Iron & Steel Co., Hamilton, O.

IRON.
(Cutting Apparatus.)
American Oxhydric Co., The, Milwaukee, Wis.

IRON.
(Forging.)
Bourne-Fuller Co., Cleveland, O.

IRON.
(Machine Cast.)
Hamilton Iron & Steel Co., Hamilton, O.

IRON.
(Pig.)
Addy, Matthew, & Co., Cincinnati, O.
Baird & West, Detroit, Mich.
Banning, Cooper & Co., Ltd., Pittsburg, Pa.
Bourne-Fuller Co., Cleveland, O.
Carnegie Steel Co., Pittsburg, Pa.
Columbus Iron & Steel Co., Columbus, O.
Corrigan, McKinney & Co., Cleveland, O.
Debevoise-Anderson Co., New York City.
DeCamp Bros. & Yule Iron, Coal & Coke Co., St. Louis, Mo.
Eaton, Rhodes & Co., Cincinnati, O.
Globe Iron Co., Jackson, O.
Hamilton Iron & Steel Co., Hamilton, O.
Hanna & Co., M. A., Cleveland, O.
Hickman, Williams & Co., Chicago, Ill.
Hillman & Son, J. H., Pittsburg, Pa.
LaBelle Iron Works, Steubenville, O.
Lea, & Co., J. Tatnall, Philadelphia, Pa.
McKeefrey & Co., Leetonia, O.
Mitchell-Diggins Iron Co., Cadillac, Mich.
Mohr, J. J., & Son, Philadelphia, Pa.
Mudge, Edmund W., & Co., Pittsburg, Pa.
Pickands, Brown & Co., Chicago, Ill.
Pickands, Mather & Co., Cleveland, O.
Republic Iron & Steel Co., Pittsburg, Pa.
Rogers, Brown & Co., Cincinnati, O.
Snyder Co., W. P., Pittsburg, Pa.
Stevens, F. B., Detroit, Mich.
Stewart Iron Co., Ltd., Cleveland, O.
Superior Charcoal Iron Co., Grand Rapids, Mich.
Tennessee Coal, Iron & R. R. Co., Birm'gham, Ala.
Thomas Furnace Co., Milwaukee, Wis.
Upson Nut Co., Cleveland, O.
Walter-Wallingford & Co., Cincinnati, O.

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IRON.
(Staybolt.)
Bourne-Fuller Co., Cleveland, O.
Hagar, W. G., Iron Co., St. Louis, Mo.

IRON AND STEEL.
McCalla, Harold, Philadelphia, Pa.

IRON AND STEEL.
(Galvanized.)
American Rolling Mill Co., Middletown, O.
American Sheet & Tin Plate Co., Pittsburg, Pa.
Bourne-Fuller Co., Cleveland, O.
Buffalo Steel Co., Tonawanda, N. Y.
Empire Iron & Steel Co., Niles, O.
Inland Steel Co., Chicago. Ill.
McCalla, Harold, Philadelphia, Pa.
Newport Rolling Mill Co., Newport, Ky.
Ryerson, Jos. T., & Son, Chicago, Ill.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
Wood & Co., Alan, Philadelphia, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

IRON AND STEEL.
(Scrap.)
American Bridge Co. of New York, New York.
Bourne-Fuller Co., Cleveland, O.
Mudge & Co., Edmund, Pittsburg, Pa.
Richardson & Co., Pittsburg, Pa.

JOINTS.
(Rail.)
Carnegie Steel Co., Pittsburg, Pa.
Chisholm & Moore Co., Cleveland, O.
Lackawanna Steel Co., New York City.

KETTLES.
(Galvanizing.)
Wilfong Iron Works Co., M. F., Philadelphia.

KEYS AND COTTERS.
(Machine.)
Standard Gauge Steel Co., Beaver Falls, Pa.

KEYSEATERS.
Baker Bros., Toledo, O.
Ryerson, Joseph T., & Son, Chicago, Ill.

LADLES.
Canton Boiler & Engrg. Co., Canton, O.
Lake Erie Boiler Works, Buffalo, N. Y.
Mitts & Merrill, Saginaw, Mich.
Northern Engineering Works, Detroit, Mich.
Obermayer, S., Co., Cincinnati, O.
Riter-Conley Mfg. Co., Pittsburg, Pa.
Whiting Fdy. & Equipment Co., Harvey, Ill.

LAMPS.
Obermayer, S., Co., Cincinnati, O.
Smith, J. D., Fdy. Supply Co., Cleveland, O.

LAMPS.
(Arc.)
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., Pittsburg, Pa.

LAMPS.
(Incandescent.)
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., Pittsburg, Pa.

LATH.
(Expanded.)
American Rolling Mill Co., Middletown, O.
Youngstown Iron & Steel Co., Youngstown, O.

LATH.
(Metal.)
American Rolling Mill Co., Middletown, O.
American Sheet & Tin Plate Co., Pittsburg, Pa.

LATHES.
American Tool & Machine Co., Boston, Mass.
Baird Machinery Co., Pittsburg, Pa.
Cincinnati Bickford Tool Co., Cincinnati, O.
Cincinnati Iron & Steel Co., Cincinnati, O.
Jones & Lamson Mach. Co., Springfield, Vt.
Le Blond Mach. Tool Co., R. K., Cincinnati, O.
Lodge & Shipley Mach. Tool Co., Cincinnati, O.
Manning, Maxwell & Moore, Inc., New York.
McCabe, J. J., New York City.
Motch & Merryweather Mach. Co., Cleveland, O.
Niles-Bement-Pond Co., New York City.
Ryerson, Joseph T., & Son, Chicago, Ill.
Schumacher & Boye, Cincinnati, O.
Vandyck, Churchill Co., New York City.

LEATHER.
(Prepared for Dry Barrel Tumbling.)
Peckham Mfg. Co., The, Newark, N. J.

LEATHER.
(Lace.)
Chicago Rawhide Mfg. Co., Chicago, Ill.

LETTERS.
(Pattern.)
Obermayer, S., Co., Cincinnati, O.

LINE MATERIAL.
(Telegraph and Telephone.)
Inland Steel Co., Chicago, Ill.

LININGS.
(Cupola.)
Ashland Fire Brick Co., Ashland, Ky.
Harbison-Walker Refractories Co., Pittsburg, Pa.
Stevens, Frederic B., Detroit, Mich.

LININGS.
(Forge and Furnace.)
Ashland Fire Brick Co., Ashland, Ky.
Harbison-Walker Refractories Co., Pittsburg, Pa.
Pyro Clay Products Co., Oak Hill, O.

LININGS.
(Ladle.)
Ashland Fire Brick Co., Ashland, Ky.
Harbison-Walker Refractories Co., Pittsburg, Pa.
Pyro Clay Products Co., Oak Hill, O.

LININGS.
(Locomotive, Fire Brick.)
Ashland Fire Brick Co., Ashland, Ky.
Harbison-Walker Refractories Co., Pittsburg, Pa.

LININGS.
(Soaking Pit.)
Ashland Fire Brick Co., Ashland, Ky.
Harbison-Walker Refractories Co., Pittsburg, Pa.

LOCKERS.
(Metal.)
Bernstein Mfg. Co., Philadelphia, Pa.

LOCOMOTIVES.
(Electric.)
General Electric Co., Schenectady, N. Y.

LOCOMOTIVES.
(Industrial.)
Vulcan Iron Works, Wilkesbarre, Pa.

LUBRICATORS.
Eynon-Evans Mfg. Co., Philadelphia, Pa.

LUMBER.
(Boxing, Crating, Flask and Pattern.)
Johnson Lumber Co., Milwaukee, Wis.

MACHINERY.
(Automatic Gear Cutting.)
Motch & Merryweather Machy. Co., Cleveland.

MACHINERY.
(Automatic Screw.)
National Sewing Mch. Co., Belvidere, Ill.

MACHINERY.
(Barb Wire Fence, Barb Nail Wire, Wire Mills.)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

MACHINERY.
(Bending and Straightening.)
Bertsch & Co., Cambridge City, Ind.
Birdsboro Steel Fdy. & Mch. Co., Birdsboro, Pa.
Bliss Co., E. W., Brooklyn, N. Y.
Cleveland Punch & Shear Wks. Co., Cleveland.
Espen-Lucas Mach. Works, Philadelphia, Pa.
Long & Allstatter Co., Hamilton, O.
Mesta Machine Co., Pittsburg, Pa.
Morgan Engineering Co., Alliance, O.
Ryerson, Joseph T., & Son, Chicago, Ill.
Toledo Machine & Tool Co., Toledo, O.
United Engineering & Fdy. Co., Pittsburg, Pa.
Watson-Stillman Co., New York, N. Y.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.

MACHINERY.
(Blue Printing.)
Amer. Drafting Furniture Co., Rochester, N. Y.
Buckeye Engine Co., Salem, O.

MACHINERY.
(Boilermakers.)
Scully Steel & Iron Co., Chicago, Ill.

MACHINERY.
(Bolt and Nut.)
Baird Machinery Co., Pittsburg, Pa.
National Machy. Co., Tiffin, O.
Standard Engineering Co., Ellwood City, Pa.
Waterbury Farrel Fdy. & Mch. Co., Wat'r'by, Ct.
Williams Tool Co., Erie, Pa.

MACHINERY.
(Boring and Turning.)
Baker Bros., Toledo, O.
Cincinnati Bickford Tool Co., Cincinnati, O.
Espen-Lucas Mach. Works, Philadelphia, Pa.
McCabe, J. J., New York City.
Mitts & Merrill, Saginaw, Mich.
Motch & Merryweather Machy. Co., Cleveland.
Niles-Bement-Pond Co., New York City.
Warner & Swasey Co., Cleveland, O.

MACHINERY.
(Buckle Tongue.)
Adt & Son, John, New Haven, Conn.

MACHINERY.
(Butt Drilling and Milling.)
Adt & Son, John, New Haven, Conn.

MACHINERY.
(By-Products Coke Ovens.)
Koppers, H., Joliet, Ill.

MACHINERY.
(Cement.)
Vulcan Iron Works, Wilkesbarre, Pa.

MACHINERY.
(Coil and Trace Chain, Welded Chain Factories.)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

MACHINERY.
(Coke Ovens.)
Koppers, H., Joliet, Ill.

MACHINERY.
(Cotter Pin.)
Shuster Co., F. B., New Haven, Conn.

MACHINERY.
(Crushing.)
Bartlett & Snow Co., C. O., Cleveland, O.
Birdsboro Steel Fdy.&Mch. Co., Birdsboro, Pa.
Farrel Foundry & Mach. Co., Ansonia, Conn.
Jeffrey Mfg. Co., Columbus, O.
Wellman-Seaver-Morgan Co., Cleveland, O.

MACHINERY.
(Cutting Off) (Cold Metal.)
Bignall & Keeler Mfg. Co., Edwardsville, Ill.
Birdsboro Steel Fdy. & Mach. Co., Birdsboro, Pa
Cleveland Punch & Shear Wks. Co., Cleveland.
Garrison Foundry Co., A., Pittsburg, Pa.
Espen-Lucas Machine Works, Philadelphia, Pa.
Ryerson, Jos. T., & Son, Chicago, Ill.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.

MACHINERY.
(Elevating and Conveying.)
Bartlett & Snow Co., C. O., Cleveland, O.
Brown Hoisting Machinery Co., Cleveland, O.
Dodge Mfg. Co., Mishawaka, Ind.
Jeffrey Mfg. Co., Columbus, O.
McMyler Interstate Co., Cleveland, O.
Russel Wheel & Fdy. Co., Detroit, Mich.
Stephens-Adamson Mfg. Co., Aurora, Ill.
Vulcan Iron Works, Wilkesbarre, Pa.
Wellman-Seaver-Morgan Co., Cleveland, O.

MACHINERY.
(Forging.)
Bliss Co., E. W., Brooklyn, N. Y.
Merrill Bros., Brooklyn, N. Y.
Morgan Engineering Co., Alliance, O.
National Machy. Co., Tiffin, O.
Toledo Mach. and Tool Co., Toledo, O.
United Engineering & Fdy. Co., Pittsburg, Pa.
Waterbury Farrel Fdy. & Mch. Co., Wat'r'bry, Ct.

MACHINERY.
(Galvanizing.)
Morgan Construction Co., Worcester, Mass.
Wilfong Iron Wks. Co., M. F., Philadelphia, Pa.

MACHINERY.
(Gear Cutting.)
Cincinnati Gear Cutting Mach. Co., Cincinnati, O.
Cincinnati Shaper Co., Cincinnati, O.
Gleason Works, Rochester, N. Y.

MACHINERY.
(Grinding.)
Cincinnati Electrical Tool Co., Cincinnati, O.
Cleveland Pneumatic Tool Co., Cleveland, O.
Independent Pneumatic Tool Co., Chicago, Ill.
Landis Tool Co., Waynesboro, Pa.
Motch & Merryweather Mch. Co., Cleveland, O.

MACHINERY.
(Hydraulic.)
Chambersburg Eng. Co., Chambersburg, Pa.
Mesta Machine Co., Pittsburg, Pa.
Ryerson, Jos. T., & Son, Chicago, Ill.
United Engineering & Fdy. Co., Pittsburg, Pa.
Waterbury Farrel Fdy. & Mch. Co., Wat'r'bry, Ct.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.

MACHINERY.
(Metal Working.)
Cincinnati Iron & Steel Co., Cincinnati, O.

MACHINERY.
(Milling.)
Cincinnati Milling Mach. Co., Cincinnati, O.
Espen-Lucas Mach. Works, Philadelphia, Pa.
Foote Bros. Gear & Mach. Co., Chicago, Ill.
Le Blond Mach. Tool Co., R. K., Cincinnati, O.
McCabe, J. J., New York City.
Motch & Merryweather Mach. Co., Cleveland.
Niles-Bement-Pond Co., New York City.
Vandyck Churchill Co., New York City.
Warner & Swasey Co., Cleveland, O.

MACHINERY.
(Mining.)
Birdsboro Steel Fdy. & Mch. Co., Birdsboro, Pa.
Farrel Foundry & Mach. Co., Ansonia, Conn.
Jeffrey Mfg. Co., Columbus, O.
Lake Erie Engineering Wks., Buffalo, N. Y.
McMyler Interstate Co., Cleveland, O.
Prescott Steam Pump Wks., Milwaukee, Wis.
Thew Automatic Shovel Co., Lorain, O.
Union Foundry & Machine Co., Pittsburg, Pa.
Vulcan Steam Shovel Co., Toledo, O.
Wellman-Seaver-Morgan Co., Cleveland, O.

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MACHINERY.
(Molding.)
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.

MACHINERY.
(Pipe Mill.)
Bignall & Keeler Mfg. Co., Edwardsville, Ill.
National Machy. Co., Tiffin, O.
Standard Engineering Co., Ellwood City, Pa.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.
Williams Tool Co., Erie, Pa.

MACHINERY.
(Rivet Spinning.)
Greiner Co., Chas., New Haven, Conn.

MACHINERY.
(Rolling Mill.)
Alliance Machine Co., Alliance, O.
American Roll & Fdy. Co., Canton, O.
Bertsch & Co., Cambridge City, Ind.
Birdsboro Steel Fdy. & Mch. Co., Birdsboro, Pa.
Bucyrus Steel Casting Co., Bucyrus, O.
Farrel Foundry & Mach. Co., Ansonia, Conn.
Garrison, A., Foundry Co., Pittsburg, Pa.
Hyde Park Fdy. & Mch. Co., Hyde Park, Pa.
Lake Erie Engineering Works, Buffalo, N. Y.
Mackintosh, Hemphill & Co., Pittsburg, Pa.
Mesta Machine Co., Pittsburg, Pa.
Morgan Construction Co., Worcester, Mass.
Morgan Engineering Co., Alliance, O.
Newbold, R. S., & Son Co., Norristown, Pa.
Pfannmueller Engineering Co., Chicago, Ill.
Standard Engineering Co., Ellwood City, Pa.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
Union Fdy. & Mach. Co., Pittsburg, Pa.
United Engineering & Fdy. Co., Pittsburg, Pa.
Waterbury Farrel Fdy. & Mch. Co., Wat'r'by, Ct.
Wellman-Seaver-Morgan Co., Cleveland, O.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.
Wisconsin Engine Co., Corliss, Wis.
Youngstown Fdy. & Mch. Co., Youngstown, O.

MACHINERY.
(Second Hand.)
Baird Machinery Co., Pittsburg Pa.
Cincinnati Iron & Steel Co., Cincinnati, O.
Fitzsimons, W. J., Cleveland, O.
Lodge & Shipley Mch. Tool Co., Cincinnati, O.
McCabe, J. J., New York City.
Motch & Merryweather Mch. Co., Cleveland, O.
Niles-Bement-Pond Co., New York City.
Pfannmueller Engineering Co., Chicago, Ill.
Ryerson, Jos. T., & Son, Chicago, Ill.
Toomey, Frank, Philadelphia, Pa.

MACHINERY.
(Shovel.)
Toledo Machine & Tool Co., Toledo, O.
Union Foundry & Mach. Co., Pittsburg, Pa.

MACHINERY.
(Special.)
Alliance Machine Co., Alliance, O.
Bilgram Machine Wks., Philadelphia, Pa.
Bliss Co., E. W., Brooklyn, N. Y.
Bucyrus Steel Casting Co., Bucyrus, O.
Foote Bros. Gear & Machine Co., Chicago, Ill.
Franklin Mfg. Co., New Haven, Conn.
Greiner Co., Chas., New Haven, Conn.
Kilby Mfg. Co., Cleveland, O.
Long & Allstatter Co., Hamilton, O.
Manning, Maxwell & Moore, Inc., New York.
Merrill Bros., Brooklyn, N. Y.
Mesta Machine Co., Pittsburg, Pa.
Morgan Engineering Co., Alliance, O.
Nazel Eng'r'g & Mach. Wks., Philadelphia, Pa.
Shuster Co., F. B., New Haven, Conn.
Standard Engineering Co., Ellwood City, Pa.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
Union Fdy. & Mach. Co., Pittsburg, Pa.
Waterbury Farrel Fdy. & Mch. Co., Wat'r'bry, Ct.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.

MACHINERY.
(Spike and Nail.)
National Machinery Co., Tiffin, O.

MACHINERY.
(Staple.)
Adt & Son, John, New Haven, Conn.

MACHINERY.
(Tapping.)
Baker Bros., Toledo, O.
Cincinnati Bickford Tool Co., Cincinnati, O.
National Machinery Co., Tiffin, O.
Standard Engineering Co., Ellwood City, Pa.

MACHINERY.
(Thread Rolling.)
Bliss Co., E. W., Brooklyn, N. Y.
Waterbury Farrel Fdy.&Mch. Co., Wat'r'bry, Ct.

MACHINERY.
(Tin House.)
Birdsboro Steel Fdy. & Mch. Co., Birdsboro, Pa.
Mesta Machine Co., Pittsburg, Pa.
Swindell, Wm., & Bros., Pittsburg, Pa.
Union Foundry & Machine Co., Pittsburg, Pa.
United Engineering & Fdy. Co., Pittsburg, Pa.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.

MACHINERY.
(Wire Drawing, Wire and Rivet Works.)
Humphrey & Sons, Joliet, Ill.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

MACHINERY.
(Wire.)
Greiner Co., Chas., New Haven, Conn.
Shuster Co., F. B., New Haven, Conn.

MACHINERY.
(Wire Galvanizing, Wire Tinning, Wire Nails.)
Humphrey & Sons, Joliet, Ill.
Morgan Construction Co., Worcester, Mass.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

MACHINERY.
(Wire Nails and Staples, Wire Nail Mills.)
Humphrey & Sons, Joliet, Ill.
Kilby Mfg. Co., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

MACHINISTS.
Johnston & Jennings Co., Cleveland, O.
Massillon Fdy. & Machine Co., Massillon, O.
Nazel Eng'r'g & Mach. Wks., Philadelphia, Pa.

MACHINES.
(Centrifugal.)
Koppers, H., Joliet, Ill.

MACHINES.
(Drilling.)
Manning, Maxwell & Moore, Inc., New York.
Massillon Fdy. & Machine Co., Massillon, O.

MACHINES.
(Screw.)
National Acme Mfg. Co., Cleveland, O.
National Sewing Mch Co., Belvidere, Ill.

MACHINES.
(Keyseat Milling.)
Mitts & Merrill, Saginaw, Mich.

MAGNESITE.
American Refractories Co., Chicago, Ill.
Harbison-Walker Refractories Co., Pittsburg, Pa.

MAGNESITE.
(Dead Burned.)
Harbison-Walker-Refractories Co., Pittsburg, Pa.
Stowe-Fuller Co., Cleveland, O.

MAGNETS.
(Lifting.)
Cutler-Hammer Clutch Co., Milwaukee, Wis.
Electric Controller & Mfg. Co., Cleveland, O.

METAL.
(Expanded.)
Youngstown Iron & Steel Co., Youngstown, O.

METALS.
(Antimony, Copper.)
Blackwell Sons & Co., Ltd., Liverpool, Eng.
Enterprise Metal Co., Syracuse, N. Y.

METALS.
(Autogenous Welding.)
American Oxhydric Co., The, Milwaukee, Wis.
National Welding & Mfg. Co., Buffalo, N. Y.

METALS.
(Cutting Apparatus.)
American Oxhydric Co., The, Milwaukee, Wis.

MILLS.
(Billet.)
Morgan Construction Co., Worcester, Mass.

MILLS.
(Wire Complete Equipment.)
Humphrey & Sons, Joliet, Ill.
Morgan Construction Co., Worcester, Mass.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.
Waterbury Farrel Fdy.&Mch. Co., Wat'r'bry, Ct.

MODELS.
(Made to Order.)
Standard Pattern Works Co., Cleveland, O.

MOLDS.
(Ingot.)
Carnegie Steel Co., Pittsburg, Pa.
Interstate Foundry Co., Cleveland, O.
Marshall Foundry Co., Pittsburg, Pa.
Union Foundry Co., Pittsburg, Pa.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.
Youngstown Fdy. & Mch. Co., Youngstown, O.

MOTORS.
(Air.)
Chisholm & Moore Mfg. Co., Cleveland, O.
Cleveland Pneumatic Tool Co., Cleveland, O.
Dake Engine Co., Grand Haven, Mich.
Detroit Hoist & Machine Co., Detroit, Mich.
Independent Pneumatic Tool Co., Chicago, Ill.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.
Westinghouse Elec. & Mfg. Co., Pittsburg, Pa.

MOTORS.
(Electric D. C. and A. C.)
Crocker-Wheeler Co., Ampere, N. J.
General Electric Co., Schenectady, N. Y.
Sprague Electric Co., New York City.
Westinghouse Elec. & Mfg. Co., Pittsburg, Pa.

MOTORS.
(Mill.)
Crocker-Wheeler Co., Ampere, N. J.

NAILS.
American Steel & Wire Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburg, Pa.
LaBelle Iron Works, Steubenville, O.
Pittsburg Steel Co., Pittsburg, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

NUTS.
American Bridge Co., of New York, New York
American Iron & Steel Mfg. Co., Lebanon, Pa.
Cleveland City Forge & Iron Co., Cleveland, O.
Graham Nut Co., Pittsburg, Pa.
Lebanon Valley Iron & Steel Co., Lebanon, Pa.
Lockhart Iron & Steel Co., Pittsburg, Pa.
Michigan Bolt & Nut Wks., Detroit, Mich.
Milton Mfg. Co., Milton, Pa.
National Bolt & Nut Co., Pittsburg, Pa.
Oliver Iron & Steel Co., Pittsburg, Pa.
Republic Iron & Steel Co., Chicago, Ill.
Rockford Bolt Co., Rockford, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Ryerson, Joseph T., & Son, Chicago, Ill.
Steel Car Forge Co., Pittsburg, Pa.
Upson Nut Co., Cleveland, O.

NUTS.
(Cold Punched.)
National Bolt & Nut Co., Pittsburg, Pa.

NUTS.
(Hot Forged.)
National Bolt & Nut Co., Pittsburg, Pa.

NUTS.
(Hot Pressed.)
National Bolt & Nut Co., Pittsburg, Pa.

ORE.
(Chrome.)
American Refractories Co., Chicago, Ill.
Blackwell & Sons Co., Ltd., Liverpool, Eng.
Harbison-Walker Refractories Co., Pittsburg, Pa.
Stowe-Fuller Co., Cleveland, O.

ORE.
(Iron.)
Blackwell, Sons & Co., Ltd., Liverpool, Eng.
Breitung, E. N., & Co., Cleveland, O.
Corrigan, McKinney & Co., Cleveland, O.
Debevoise-Anderson Co., New York City.
Hanna, M. A., & Co., Cleveland, O.
Hillman & Son, J. H., Pittsburg, Pa.
LaBelle Iron Works, Steubenville, O.
Lea, J. Tatnall, & Co., Philadelphia, Pa.
Oglebay, Norton & Co., Cleveland, O.
Pickands, Brown & Co., Chicago, Ill.
Pickands, Mather & Co., Cleveland, O.
Snyder & Co., W. P., Pittsburg, Pa.
Tod-Stambaugh Co., Cleveland, O.

OVENS.
Koppers, H., Joliet, Ill.

OVENS.
(By-Products Coke Ovens.)
Koppers, H., Joliet, Ill.
United Coke & Gas Co., The, New York.

OVENS.
(Coke.)
Koppers, H., Joliet, Ill.

OVENS.
(Coke, with recovery of By-Products.)
United Coke & Gas Co., New York.

OVENS.
(Core.)
Northern Engineering Works, Detroit, Mich.
Obermayer, S., Co., Cincinnati, O.
Whiting Foundry Equipment Co., Harvey, Ill.

OXYGEN.
American Oxhydric Co., The, Milwaukee, Wis.

PACKING.
Jenkins Bros., New York City.
Shaw-Kendall Engineering Co., Toledo, O.

PACKING.
(Rawhide Hydraulic.)
Chicago Rawhide Mfg. Co., Chicago, Ill.

PATTERNS.
Birdsboro Steel Fdy. & Mch. Co., Birdsboro, Pa.
Lake Erie Engineering Works, Buffalo, N. Y.
Standard Pattern Works Co., Cleveland, O.
Wellman-Seaver-Morgan Co., Cleveland, O.
Youngstown Fdy. & Mch. Co., Youngstown, O.

PATTERNS.
(Metal.)
Superior Pattern Works, Cleveland, O.

PATTERNS.
(Wood.)
Superior Pattern Works, Cleveland, O.

PENSTOCKS.
Canton Boiler & Engrg. Co., Canton, O.
Struthers-Wells Co., Warren, Pa.

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PERFORATING.
(Sheet Metal-Automatic, Screen Work.)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

PILING.
(Steel Sheet Interlocking.)
Cambria Steel Co., Johnstown, Pa.
Carnegie Steel Co., Pittsburg, Pa.
Jones & Laughlin Steel Co., Pittsburg, Pa.
Lackawanna Steel Co., New York City.

PINIONS.
(Rawhide.)
Ganschow, Wm., Co., Chicago, Ill.
New Process Rawhide Co., Syracuse, N. Y.

PINS.
(Knuckle and Brake.)
Champion Rivet Co., Cleveland, O.
Oliver Iron & Steel Co., Pittsburg, Pa.

PINS.
(Pivot.)
Champion Rivet Co., Cleveland, O.

PINS.
(Taper.)
National Sewing Mch. Co., Belvidere, Ill.

PIPE.
Bourne-Fuller Co., Cleveland, O.
Central Tube Co., Pittsburg, Pa.
LaBelle Iron Works, Steubenville, O.
Lake Erie Iron Works, Buffalo, N. Y.
Mudge & Co., Edmund W., Pittsburg, Pa.
National Tube Co., Pittsburg, Pa.
Pittsburgh Metal Products Co., Pittsburgh, Pa. "Am. Ingot Iron."
Pittsburg Valve, Fdy. & Const. Co., Pittsburg.
Riter-Conley Mfg. Co., Pittsburg, Pa.
Shaw-Kendall Engineering Co., Toledo, O.
Struthers-Wells Co., Warren, Pa.
U. S. Cast Iron Pipe & Fdy. Co., New York.
Youngstown Sheet & Tube Co., Youngstown, O.

PIPE.
(Cast Iron.)
Massillon Iron & Steel Co., Massillon, O.

PIPE.
(Cast Iron, Flanged.)
Massillon Iron & Steel Co., Massillon, O.

PIPE.
(Riveted Steel.)
American Bridge Co. of New York, New York.
Canton Boiler & Engrg. Co., Canton, O.
McAllister-Byrne Const. Co., Girard, O.
Riter-Conley Mfg. Co., Pittsburg, Pa.
Rochester Bridge Co., Rochester, N. Y.
Struthers-Wells Co., Warren, Pa.

PIPE.
(Second Hand.)
Foster Co., L. B., Pittsburg, Pa.

PIPE.
(Wrought Iron.)
Bourne-Fuller Co., Cleveland, O.
National Tube Co., Pittsburg, Pa.
Pittsburg Piping & Equipment Co., Pittsburg.

PIPING.
(Contractors.)
Pittsburg Piping & Equipment Co., Pittsburg, Pa.

PLANERS.
Cincinnati Iron & Steel Co., Cincinnati, O.
Cincinnati Shaper Co., Cincinnati, O.
Manning, Maxwell & Moore, Inc., New York.
McCabe, J. J., New York City.
Motch & Merryweather Mchy. Co., Cleveland.
Ryerson, Joseph T., & Son, Chicago, Ill.
Wickes Bros., Pittsburg, Pa.
Vandyck-Churchill Co., New York City.

PLANTS.
(By-Products Coke Ovens.)
Koppers, H., Joliet, Ill.

PLANTS.
(Galvanizing.)
Wilfong Iron Works Co., Philadelphia, Pa.

PLATE.
(Tin.)
American Sheet & Tin Plate Co., Pittsburg, Pa.
Harvey Co., Arthur C., Boston, Mass.
Jones & Laughlin Steel Co., Pittsburg, Pa.
Phillips Sheet & Tin Plate Co., Weirton, W. Va.
Standard Tin Plate Co., Canonsburg, Pa.
Taylor, N. & G., Philadelphia, Pa.

PLATES.
American Rolling Mill Co., Middletown, O.
American Sheet & Tin Plate Co., Pittsburg, Pa.
Bourne-Fuller Co., Cleveland, O.
Buffalo Steel Co., Tonawanda, N. Y.
Cambria Steel Co., Johnstown, Pa.
Empire Iron & Steel Co., Niles, O.
Inland Steel Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburg, Pa.
Kratzer, W. N., & Co., Pittsburg, Pa.
LaBelle Iron Works, Steubenville, O.
Lackawanna Steel Co., New York City.
Mudge, Edmund W., & Co., Pittsburg, Pa.
North Works, Chicago, Ill.
Otis Steel Co., Cleveland, O.
Phillips Sheet & Tin Plate Co., Weirton, W. Va.
Pittsburgh Metal Products Co., Pittsburgh, Pa.,
Portsmouth Steel Co., Portsmouth, O.
Republic Iron & Steel Co., Chicago, Ill.
Ryerson, Jos. T., & Son, Chicago, Ill.
Seneca Iron & Steel Co., Buffalo, N. Y.
Taylor, N. & G., Co., Philadelphia, Pa.
Tennessee Coal, Iron & R. R. Co., Pittsburg.
Union Iron & Steel Co., Cincinnati, O.
United Steel Co., Canton, O.
Wood, Alan, Iron & Steel Co., Philadelphia, Pa.
Worth Bros. Co., Coatesville, Pa.

PLATES.
(Boiler and Tank.)
American Rolling Mill Co., Middletown, O.
Bourne-Fuller Co., Cleveland, O.
Cambria Steel Co., Johnstown, Pa.
Hagar, W. G., Iron Co., St. Louis, Mo.
LaBelle Iron Works Co., Steubenville, O.
Pittsburgh Metal Products Co., Pittsburgh, Pa. "Am. Ingot Iron."
Portsmouth Steel Co., Portsmouth, O.
Ryerson, Jos. T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.

PLATES.
(Felloe.)
Wrought Washer Mfg. Co., Milwaukee, Wis.

PLATES.
(Floor.)
Carnegie Steel Co., Pittsburg, Pa.

PLATES.
(Rapping.)
Obermayer, S., Co., Cincinnati, O.

PLATES.
(Sheared.)
Allegheny Steel Co., Pittsburg, Pa.
Bourne-Fuller Co., Cleveland, O.
Carnegie Steel Co., Pittsburg, Pa.
Cincinnati Iron & Steel Co., Cincinnati, O.
Portsmouth Steel Co., Portsmouth, O.

PLATES.
(Tie.)
Lackawanna Steel Co., New York City.

PLATES.
(Universal.)
Bourne-Fuller Co., Cleveland, O.
Carnegie Steel Co., Pittsburg, Pa.
Hagar, W. G., Iron Co., St. Louis, Mo.

PLATES.
(Universal, Open-Hearth.)
United Steel Co., Canton, O.

PLUMBAGO.
Dixon, Joseph, Crucible Co., Jersey City, N. J.
Obermayer, S., Co., Cincinnati, O.
Stevens, F. B., Detroit, Mich.

POINTERS.
(Wire Rod, Wire Mills.)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

POLISHING MEAL.
(For Dry Tumbling Barrels.)
Peckham Mfg. Co., The, Newark, N. J.

PRESSES.
Birdsboro Steel Fdy. & Mch. Co., Birdsboro, Pa.
Bliss, E. W., Co., Brooklyn, N. Y.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cleveland Punch & Shear Wks. Co., Cleveland.
Farrel Fdy. & Machine Co., Ansonia, Conn.
Lake Erie Engineering Works, Buffalo, N. Y.
Mackintosh, Hemphill & Co., Pittsburg, Pa.
Mesta Machine Co., Pittsburg, Pa.
Morgan Engineering Co., Alliance, O.
National Machy. Co., Tiffin, O.
Niles-Bement-Pond Co., New York City.
Ryerson, Jos. T., & Son, Chicago, Ill.
Toledo Machine & Tool Co., Toledo, O.
United Engineering & Fdy. Co., Pittsburg, Pa.
Waterbury Farrel Fdy.&Mch. Co., Wat'r'bry, Ct.
Watson-Stillman Co., New York, N. Y.
Wood, R. D., Co., Philadelphia, Pa.

PRESSES.
(Busheling.)
Famous Mfg. Co., East Chicago, Ind.

PRESSES.
(Forging.)
Garrison, A., Foundry Co., Pittsburg, Pa.
United Engineering & Fdy. Co., Pittsburg, Pa.

PRESSES.
(Hydraulic.)
Raquette Fdy. & Supply Co., Massena, N. Y.
United Engineering & Fdy. Co., Pittsburg, Pa.
Watson-Stillman Co., New York, N. Y.

PRESSES.
(Power.)
United Engineering & Fdy. Co., Pittsburg, Pa.

PRESSES.
(Sheet Metal, Scrap.)
Famous Mfg. Co., East Chicago, Ind.

PRESSES.
(Steam, Sleeves, Runner Brick, Nozzles and Tuyeres, Fire Brick Works.)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

PRODUCERS.
(Gas.)
Cooper, C. & G., Co., Mt. Vernon, O.
Eynon-Evans Mfg. Co., Philadelphia, Pa.
Hagen, G. J., Pittsburg, Pa.
Koppers, H., Joliet, Ill.
Laughlin & Co., Alex., Pittsburg, Pa.
McClure, Son & Co.., G. W., Pittsburg, Pa.
Morgan Construction Co., Worcester, Mass.
Sharon Boiler Works, Sharon, Pa.
Smythe Co., S. R., Pittsburg, Pa.
Struthers-Wells Co., Warren, Pa.
Swindell & Bros., Wm., Pittsburg, Pa.
Wellman-Seaver-Morgan Co., Cleveland, O.
Wood & Co., R. D., Philadelphia, Pa.

PULLEYS.
Dodge Mfg. Co., Mishawaka, Ind.
Jones & Loughlin Steel Co., Pittsburg, Pa.
Mesta Machine Co., Pittsburg, Pa.

PUMPS.
Aldrich Pump Dept., Allentown, Pa.
Cameron Steam Pump Wks., New York City.
Chambersburg Engrg. Co., Chambersburg, Pa.
Dean Bros. Steam Pump Works, Indianapolis.
Deming Co., Salem, O.
Erie Pump & Engine Works, Erie, Pa.
Lake Erie Engineering Works, Buffalo, N. Y.
McGowan, J. H., Co., Cincinnati, O.
Prescott Steam Pump Co., Milwaukee, Wis.
Rockwell Furnace Co., New York, N. Y.
Shaw-Kendall Engineering Co., Toledo, O.
Southwark Fdy. & Mch. Co., Philadelphia, Pa.
Waterbury Farrel Fdy. & Mch. Co., Wat'r'bry, Ct.

PUMPS.
(Boiler Feed.)
Cameron Steam Pump Wks., New York City.
Dean Bros. Steam Pump Works, Indianapolis.
Deming Co., Salem, O.
McGowan, J. H., Co., Cincinnati, O.
Pittsburg Valve, Fdy. & Const. Co., Pittsburg.
Prescott Steam Pump Co., Milwaukee, Wis.

PUMPS.
(Electric or Power.)
Aldrich Pump Dept., Allentown, Pa.

PUMPS.
(Steam.)
Cameron Steam Pump Wks., New York City.
Dean Bros. Steam Pump Works, Indianapolis.
Deming Co., Salem, O.
McGowan, J. H., Co., Cincinnati, O.
Pfanmueller Engineering Co., Chicago, Ill.
Pittsburg Valve, Fdy. & Const. Co., Pittsburg.
Prescott Steam Pump Co., Milwaukee, Wis.
Wood, R. D., & Co., Philadelphia, Pa.

PUMPS.
(Vacuum.)
American Air Compressor Wks., New York.
American Compressor & Pump Co., Baltimore.
Cameron Steam Pump Wks., New York City.
McGowan, J. H., Co., Cincinnati, O.
Mesta Machine Co., Pittsburg, Pa.

PUNCHES AND SHEARS.
Allen, John F., Co., New York City.
Alliance Machine Co., Alliance, O.
Birdsboro Steel Fdy. & Mch. Co., Birdsboro, Pa.
Bliss, E. W., Co., Brooklyn, N. Y.
Cincinnati Iron & Steel Co., Cincinnati, O.
Cleveland Punch & Shear Wks. Co., Cleveland.
Covington Mch. Co., Covington, Va.
Long & Allstatter Co., Hamilton, O.
Mackintosh, Hamphill & Co., Pittsburg, Pa.
Mesta Machine Co., Pittsburg, Pa.
Mitts & Merrill, Saginaw, Mich.
Morgan Engineering Co., Alliance, O.
National Machinery Co., Tiffin, O.
Niles-Bement-Pond Co., New York City.
Ryerson, Joseph T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Southwark Fdy. & Mch. Co., Philadelphia, Pa.
Toledo Machine & Tool Co., Toledo, O.
United Engineering & Fdy. Co., Pittsburg, Pa.
Wood, R. D., & Co., Philadelphia, Pa.

PUNCHES.
(Hand.)
Bourne-Fuller Co., Cleveland, O.
Cincinnati Iron & Steel Co., Cincinnati, O.
Ryerson, Jos. T., & Son, Chicago, Ill.

PUNCHES.
(Pneumatic.)
Allen, John F., Co., New York City.

PUNCHES.
(Hydraulic.)
Watson-Stillman Co., New York, N. Y.

PYROMETERS.
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Philadelphia, Pa.
Stupakoff, S. H., Pittsburg, Pa.

RAILS.
Bourne-Fuller Co., Cleveland, O.
Buckeye Rolling Mill Co., Steubenville, O.
Cambria Steel Co., Johnstown, Pa.
Carnegie Steel Co., Cincinnati, O.
Foster Co., L. B., Pittsburg, Pa.
Jones & Laughlin Steel Co., Pittsburg, Pa.
Lackawanna Steel Co., New York City.
North Works, Chicago, Ill.
Republic Iron & Steel Co., Pittsburg, Pa.
Richardson & Co., Pittsburg, Pa.
Tennessee Coal, Iron & R. R. Co., Pittsburg.

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RAILWAYS.
(Industrial.)
Wiener Co., Ernst, New York, N. Y.

RAMMERS.
(Bench.)
Obermayer, S., Co., Cincinnati, O.

REAMERS.
Cleveland Twist Drill Co., Cleveland, O.

RECEIVERS.
(Air.)
American Air Compressor Works, New York.
Independent Pneumatic Tool Co., Chicago, Ill.
Lake Erie Boiler Works, Buffalo, N. Y.

REELS.
(Wood and Iron, Wire Mills.)
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

REGENERATORS.
Rateau Steam Regenerator Co., New York City.

REGULATORS.
(Boiler Feed Water, Open Feed Water Heater and Pressure.)
Strong, Carlisle & Hammond Co., Cleveland, O.

REGULATORS.
(Speed.)
Cutler-Hammer Mfg. Co., Milwaukee, Wis.

RHEOSTATS.
(Starting, Stopping and Field.)
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., Pittsburg, Pa.

RIDDLES.
(Foundry.)
Obermayer, S., Co., Cincinnati, O.

RIVETERS.
(Elastic Rotary and High Speed.)
Adt & Son, John, New Haven, Conn.
Greiner Co., Chas., New Haven, Conn.
Shuster Co., F. B., New Haven, Conn.

RIVETERS.
(Hydraulic.)
Chambersburg Engrg. Co., Chambersburg, Pa.
Mackintosh-Hemphill Co., Pittsburg, Pa.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., New York, N. Y.
Ryerson, Joseph T., & Son, Chicago, Ill.
Wood & Co., R. D., Philadelphia, Pa.

RIVETERS.
(Pneumatic.)
Allen, John F., Co., New York City.
Bliss Co., E. W., Brooklyn, N. Y.
Cleveland Pneumatic Tool Co., Cleveland, O.
Independent Pneumatic Tool Co., Chicago, Ill.
Ryerson, Joseph T., & Son, Chicago, Ill.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.

RIVETS.
Jones & Laughlin Steel Co., Pittsburg, Pa.
Lebanon Valley Iron & Steel Co., Lebanon, Pa.
National Bolt & Nut Co., Pittsburg, Pa.
Oliver Iron & Steel Co., Pittsburg, Pa.
Progressive Mfg. Co., Torrington, Conn.

RIVETS.
(Structural, Boiler, Ship.)
American Iron & Steel Mfg. Co., Lebanon, Pa.
Bourne-Fuller Co., Cleveland, O.
Champion Rivet Co., Cleveland, O.
Lockhart Iron & Steel Co., Pittsburg, Pa.
Republic Iron & Steel Co., Pittsburg, Pa.
Ryerson, Joseph T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Steel Car Forge Co., Pittsburg, Pa.
Upson Nut Co., Cleveland, O.

RODS.
(Bridge and Roof.)
National Bolt & Nut Co., Pittsburg, Pa.

RODS.
(Drill) (Steel, Cold Drawn.)
Pittsburg Shafting Co. of Detroit, Detroit, Mich.

RODS.
(Iron and Steel.)
American Iron & Steel Mfg. Co., Lebanon, Pa.
Jones & Laughlin Steel Co., Pittsburg, Pa.
Republic Iron & Steel Co., Pittsburg, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

ROLLING MILL EQUIPMENT.
American Roll & Foundry Co., Canton, O.
Morgan Construction Co., Worcester, Mass.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.

ROLLS.
(Bending and Straightening.)
American Roll & Foundry Co., Canton, O.
Bertsch & Co., Cambridge City, Ind.
Birdsboro Steel Fdy. & Mch. Co., Birdsboro, Pa.
Cincinnati Iron & Steel Co., Cincinnati, O.
Covington Mch. Co., Covington, Va.
Mesta Machine Co., Pittsburg, Pa.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., New York City.
Ryerson, Joseph T., & Son, Chicago, Ill.
United Engineering & Fdy. Co., Pittsburg, Pa.

ROLLS.
(Sand Chilled and Steel.)
American Roll & Foundry Co., Canton, O.
Birdsboro Steel Fdy. & Mch. Co., Birdsboro, Pa.
Farrel Fdy. & Mach. Co., Ansonia, Conn.
Garrison Fdy. Co., A., Pittsburg, Pa.
Hyde Park Fdy. & Mch. Co., Hyde Park, Pa.
Mesta Machine Co., Pittsburg, Pa.
National Roll & Fdy. Co., Avonmore, Pa.
Seaman-Sleeth Co., Pittsburg, Pa.
United Engineering & Fdy. Co., Pittsburg, Pa.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.
Youngstown Fdy. & Mch. Co., Youngstown, O.

ROOFING.
(Corrugated.)
American Rolling Mill Co., Middletown, O.
American Sheet & Tin Plate Co., Pittsburg, Pa.
Bourne-Fuller Co., Cleveland, O.
Empire Iron & Steel Co., Niles, O.
Inland Steel Co., Chicago, Ill.
Stark Rolling Mill Co., Canton, O.
Thomas Steel Co., Niles, O.

ROOFING.
(Iron and Steel.)
American Bridge Co. of New York, New York.
American Rolling Mill Co., Middletown, O.
American Sheet & Tin Plate Co., Pittsburg, Pa.
Bourne-Fuller Co., Cleveland, O.
Empire Iron & Steel Co., Niles, O.
Inland Steel Co., Chicago, Ill.
Newport Rolling Mill Co., Newport, Ky.
Phillips Sheet & Tin Plate Co., Weirton, W. Va.
Taylor, N. & G., Co., Philadelphia, Pa.
Thomas Steel Co., Niles, O.
Wood, Alan, Iron & Steel Co., Philadelphia.
Youngstown Iron & Steel Co., Youngstown, O.
Youngstown Sheet & Tube Co., Youngstown, O.

ROPE.
(Wire.)
American Steel & Wire Co., Chicago, Ill.

RUNWAYS.
(Crane.)
Cleveland Crane & Engrg. Co., Wickliffe, O.

SAND BLAST.
Niagara Device Co., Buffalo, N. Y.
Pangborn Company, Thomas W., New York.
Paxson Co., J. W., Philadelphia, Pa.

SAND BLAST SYSTEMS.
Pangborn, Thomas W., Company, New York.

SAND.
(Core.)
Obermayer, S., Co., Cincinnati, O.
Paxson Co., J. W., Philadelphia, Pa.
Squier, Ed. E., Co., St. Louis, Mo.

SAND.
(Molding.)
Obermayer, S., Co., Cincinnati, O.
Paxson Co., J. W., Philadelphia, Pa.
Squier, Ed. E., Co., St. Louis, Mo.
Stevens, F. B., Detroit, Mich.

SAND SIFTING AND HANDLING MACHINERY.
Hanna Engineering Works, Chicago, Ill.
Obermayer, S., Co., Cincinnati, O.
Pangborn, Thomas W., Company, New York.
Stephens-Adamson Mfg. Co., Aurora, Ill.
Whiting Foundry Equipment Co., Harvey, Ill.

SATURATORS.
(Ammonia.)
Koppers, H., Joliet, Ill.

SAWS.
(Cold Metal.)
Birdsboro Steel Fdy. & Mch. Co., Birdsboro, Pa.
Espen-Lucas Machine Works, Philadelphia, Pa.
Ryerson, Joseph T., & Son, Chicago, Ill.
Starrett, L. S., Co., Athol, Mass.
Vandyck-Churchill Co., New York City.
Waterbury Farrel Fdy. & Mch. Co., Wat'rb'ry, Ct.

SAWS.
(Hot.)
American Roll & Foundry Co., Canton, O.
Mesta Machine Co., Pittsburg, Pa.
Morgan Construction Co., Worcester, Mass.
United Engrg. & Foundry Co., Pittsburg, Pa.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.

SCREWS.
Milton Mfg. Co., Milton, Pa.
National Sewing Mch. Co., Belvidere, Ill.
Progressive Mfg. Co., Torrington, Conn.
Republic Iron & Steel Co., Pittsburg, Pa.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Upson Nut Co., Cleveland, O.

SCREWS.
(Set.)
Allen Mfg. Co., Inc., Hartford, Conn.

SCREW STOCK.
Bourne-Fuller Co., Cleveland, O.
Pittsburg Shafting Co. of Detroit, Detroit.

SEPARATORS.
(Magnetic.)
Cutler-Hammer Clutch Co., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.

SEPARATORS.
(Steam or Oil.)
American Blower Co., Detroit, Mich.
American Tool & Machine Co., Boston, Mass.
National Separator & Mach. Co., Boston, Mass.
Pittsburg Valve, Fdy. & Const. Co., Pittsburg.
Strong, Carlisle & Hammond Co., Cleveland.

SHAFTING.
American Steel & Wire Co., Chicago, Ill.
Baird Machinery Co., Pittsburg, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Bourne-Fuller Co., Cleveland, O.
Cincinnati Iron & Steel Co., Cincinnati, O.
Dodge Mfg. Co., Mishawaka, Ind.
Farrel Fdy. & Mach. Co., Ansonia, Conn.
Hagar, W. G., Iron Co., St. Louis, Mo.
Harvey, Arthur C., & Co., Boston, Mass.
Jones & Laughlin Steel Co., Pittsburg, Pa.
Pittsburg Shafting Co. of Detroit, Detroit.
Republic Iron & Steel Co., Pittsburg, Pa.

SHAFTING.
(Holiow.)
Bliss & Laughlin, Inc., Harvey, Ill.

SHAPERS.
Baird Machinery Co., Pittsburg, Pa.
Cincinnati Iron & Steel Co., Cincinnati, O.
Cincinnati Shaper Co., Cincinnati, O.
Manning, Maxwell & Moore, Inc., New York.
McCabe, J. J., New York City.
Motch & Merryweather Mach. Co., Cleveland.
Niles-Bement-Pond Co., New York City.
Vandyck-Churchill Co., New York City.

SHAPES.
(Wire.)
Hindly Mfg. Co., The, Valley Falls, R. I.

SHAPES.
(Agricultural.)
Buffalo Steel Co., Tonawanda, N. Y.
Carnegie Steel Co., Pittsburg, Pa.
Jones & Laughlin Steel Co., Pittsburg, Pa.
Inland Steel Co., Chicago, Ill.
Republic Iron & Steel Co., Pittsburg, Pa.

SHAPES.
(Steel, Structural and Special Rolled.)
Bourne-Fuller Co., Cleveland, O.
Cambria Steel Co., Johnstown, Pa.

SHEARS.
(Billet, Bloom and Slab.)
Garrison, A., Foundry Co., Pittsburg, Pa.
Mesta Machine Co., Pittsburg, Pa.
Morgan Construction Co., Worcester, Mass.
United Engrg. & Fdy. Co., Pittsburg, Pa.

SHEARS.
(Lever.)
Mesta Machine Co., Pittsburg, Pa.
Ryerson, Joseph T., & Son, Chicago, Ill.
United Engrg. & Fdy. Co., Pittsburg, Pa.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.

SHEARS.
(Scrap, Alligator, Wire and Wire Nail Mills.)
Cincinnati Iron & Steel Co., Cincinnati, O.
Covington Mch. Co., Covington, Va.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

SHEARS.
(Squaring.)
Covington Mch. Co., Covington, Va.
Garrison, A., Foundry Co., Pittsburg, Pa.
Mesta Machine Co., Pittsburg, Pa.
Ryerson, Joseph T., & Son, Chicago, Ill.
United Engrg. & Fdy. Co., Pittsburg, Pa.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.

SHEARS.
(Vertical.)
Covington Mch. Co., Covington, Va.
Mesta Machine Co., Pittsburg, Pa.
Ryerson, Joseph T., & Son, Chicago, Ill.
United Engrg. & Fdy. Co., Pittsburg, Pa.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.

SHEETS.
(Black Steel.)
American Rolling Mill Co., Middletown, O.
American Sheet & Tin Plate Co., Pittsburg.
Bourne-Fuller Co., Cleveland, O.
Cincinnati Iron & Steel Co., Cincinnati, O.
Empire Iron & Steel Co., Niles, O.
Inland Steel Co., Chicago, Ill.
Newport Rolling Mill Co., Newport, Ky.
Ryerson, Joseph T., & Son, Chicago, Ill.
Stark Rolling Mill Co., Canton, O.
Thomas Steel Co., Niles, O.
Youngstown Iron & Steel Co., Youngstown, O.

SHEETS.
(Blue Annealed.)
American Rolling Mill Co., Middletown, O.
American Sheet & Tin Plate Co., Pittsburg.
Bourne-Fuller Co., Cleveland, O.
Inland Steel Co., Chicago, Ill.
Portsmouth Steel Co., Portsmouth, O.
Ryerson, Joseph T., & Son, Chicago, Ill.
Stark Rolling Mill Co., Canton, O.

SHEETS.
(Corrugated.)
American Rolling Mill Co., Middletown, O.
American Sheet & Tin Plate Co., Pittsburg.
Bourne-Fuller Co., Cleveland, O.
Empire Iron & Steel Co., Niles, O.
Inland Steel Co., Chicago, Ill.
Kratzer, W. N., & Co., Pittsburg, Pa.
La Belle Iron Works Steubenville, O.
Massillon Rolling Mill Co., Massillon, O.
Mudge, Edmund W., & Co., Pittsburg, Pa.
Newport Rolling Mill Co., Newport, Ky.
Ryerson, Joseph T., & Son, Chicago, Ill.
Seneca Iron & Steel Co., Buffalo, N. Y.
Stark Rolling Mill Co., Canton, O.
Thomas Steel Co., Niles, O.
Wood, Alan, Iron & Steel Co., Philadelphia.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS.
(Dead Soft for Stamping.)
American Rolling Mill Co., Middletown, O.
Allegheny Steel Co., Pittsburg, Pa.
American Sheet & Tin Plate Co., Pittsburg, Pa.
Inland Steel Co., Chicago, Ill.
Ryerson, Joseph T., & Son, Chicago, Ill.
Stark Rolling Mill Co., Canton, O.
Youngstown Iron & Steel Co., Youngstown, O.

SHEETS.
(Deep Drawing Stock.)
Allegheny Steel Co., Pittsburg, Pa.
American Rolling Mill Co., Middletown, O.
American Sheet & Tin Plate Co., Pittsburg.
Inland Steel Co., Chicago, Ill.
Youngstown Iron & Steel Co., Youngstown, O.

SHEETS.
(Galvanized.)
Allegheny Steel Co., Pittsburg, Pa.
American Rolling Mill Co., Middletown, O.
American Sheet & Tin Plate Co., Pittsburg, Pa.
Bourne-Fuller Co., Cleveland, O.
Empire Iron & Steel Co., Niles, O.
Harvey, Arthur C., & Co., Boston, Mass.
Holliday & Co., W. J., Indianapolis, Ind.
Inland Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
Massillon Rolling Mill Co., Massillon, O.
Mudge, Edmund W., & Co., Pittsburg, Pa.
Newport Rolling Mill Co., Newport, Ky.
Phelps Iron & Steel Co., Cincinnati, O.
Republic Iron & Steel Co., Pittsburg, Pa.
Ryerson, Joseph T., & Son, Chicago, Ill.
Seneca Iron & Steel Co., Buffalo, N. Y.
Stark Rolling Mill Co., Canton, O.
Thomas Steel Co., Niles, O.
Wood, Alan, Iron & Steel Co., Philadelphia, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS.
(Iron and Steel.)
Allegheny Steel Co., Pittsburg, Pa.
American Rolling Mill Co., Middletown, O.
American Sheet & Tin Plate Co., Pittsburg, Pa.
American Tube & Stamping Co., Bridgeport, Ct.
Bourne-Fuller Co., Cleveland, O.
Buffalo Steel Co., Tonawanda, N. Y.
Disston & Sons, Inc., Henry, Philadelphia.
Empire Iron & Steel Co., Niles, O.
Hagar, W. G., Iron Co., St. Louis, Mo.
Harvey, Arthur C., & Co., Boston, Mass.
Inland Steel Co., Chicago, Ill.
Kratzer, W. N., & Co., Pittsburg, Pa.
La Belle Iron Works, Steubenville, O.
Phillips Sheet & Tin Plate Co., Weirton, W. Va.
Pittsburgh Metal Products Co., Pittsburgh, Pa. "Am. Ingot Iron."
Portsmouth Steel Co., Portsmouth, O.
Republic Iron & Steel Co., Pittsburg, Pa.
Ryerson, Joseph T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Seneca Iron & Steel Co., Buffalo, N. Y.
Stark Rolling Mill Co., Canton, O.
Taylor, N. & G., Co., Philadelphia, Pa.
Tennessee Coal, Iron & R. R. Co., Pittsburg.
Thomas Steel Co., Niles, O.
United Steel Co., Canton, O.
Wood, Alan, Iron & Steel Co., Philadelphia, Pa.
Worth Bros. Co., Coatesville, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS.
(Open-Hearth.)
American Sheet & Tin Plate Co., Pittsburg, Pa.
Inland Steel Co., Chicago, Ill.
Stark Rolling Mill Co., Canton, O.
Youngstown Iron & Steel Co., Youngstown, O.

SHELVING.
(Steel.)
Bernstein Mfg. Co., Philadelphia, Pa.

SHOVELS, SPADES AND SCOOPS.
Avery Stamping Co., Cleveland, O.
Obermayer, S., Co., Cincinnati, O.

SHOVELS.
(Electric.)
Vulcan Steam Shovel Co., Toledo, O.

SHOVELS.
(Steam.)
Bucyrus Co., South Milwaukee, Wis.
Thew Automatic Shovel Co., Lorain, O.
Vulcan Steam Shovel Co., Toledo, O.

SIFTERS.
(Sand.)
Obermayer, S., Co., Cincinnati, O.
Whiting Foundry Equipment Co., Harvey, Ill.

SLABS.
Cambria Steel Co., Johnstown, Pa.
La Belle Iron Works, Steubenville, O.
Lackawanna Steel Co., New York City.
Portsmouth Steel Co., Portsmouth, O.

SLABS.
(Sheet.)
Inland Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
Mudge, Edmund W., & Co., Pittsburg, Pa.
Tennessee Coal, Iron & R. R. Co., Pittsburg.
Youngstown Sheet & Tube Co., Youngstown, O.

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Hawley Down Draft Furnace Co., Chicago.

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Stevens, F. B., Detroit, Mich.

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Dean Bros. Steam Pump Wks., Indianapolis.
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Strong, Carlisle & Hammond Co., Cleveland.

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Cincinnati Iron & Steel Co., Cincinnati, O.
Jones & Laughlin Steel Co., Pittsburg, Pa.
La Belle Iron Works, Steubenville, O.
Lebanon Valley Iron & Steel Co., Lebanon, Pa.
Republic Iron & Steel Co., Pittsburg, Pa.

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(Screw.)
Steel Car Forge Co., Pittsburg, Pa.

SPLICES.
(Rail.)
Carnegie Steel Co., Pittsburg, Pa.
Jones & Laughlin Steel Co., Pittsburg, Pa.
Lackawanna Steel Co., New York City.
Republic Iron & Steel Co., Pittsburg, Pa.

SPRINGS.
(Vanadium.)
American Vanadium Co., Pittsburg, Pa.

STACKS.
American Bridge Co. of New York, New York.
Canton Boiler & Engrg. Co., Canton, O.
McAllister-Byrne Const. Co., Girard, O.
Struthers Wells Co., Warren, Pa.

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Avery Stamping Co., Cleveland, O.
Bettcher Mfg. Co., Cleveland, O.
Hindly Mfg. Co., The, Valley Falls, R. I.

STAND-PIPES.
American Bridge Co. of New York, New York.
Canton Boiler & Engrg. Co., Canton, O.
Sharon Boiler Works, Sharon, Pa.

STAPLES.
Youngstown Sheet & Tube Co., Youngstown, O.

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(Electric Motor.)
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Electric Controller & Mfg. Co., Cleveland, O.
General Electric Co., Schenectady, N. Y.

STEEL.
American Bridge Co. of New York, New York.
Andrews Steel Co., Newport, Ky.
Banning, Cooper & Co., Ltd., Pittsburg, Pa.
Bourne-Fuller Co., Cleveland, O.
Cambria Steel Co., Johnstown, Pa.
Carnegie Steel Co., Pittsburg, Pa.
Disston & Sons, Inc., Henry, Philadelphia.
Harvey, Arthur C., Co., Boston, Mass.
Inland Steel Co., Chicago, Ill.
Interstate Iron & Steel Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburg, Pa.
La Belle Iron Works, Steubenville, O.
Lockhart Iron & Steel Co., Pittsburg, Pa.
Mudge, Edmund W., & Co., Pittsburg, Pa.
North Works, Chicago, Ill.
Otis Steel Co., Ltd., Cleveland, O.
Phelps Iron & Steel Co., Cincinnati, O.
Pittsburgh Metal Products Co., Pittsburgh, Pa., "Am. Ingot Iron."
Republic Iron & Steel Co., Pittsburg, Pa.
Ryerson, Joseph T., & Son, Chicago, Ill.
Tennessee Coal, Iron & R. R. Co., Pittsburg.
Wood, Alan, Iron & Steel Co., Philadelphia, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

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(Autogenous Welding.)
American Oxhydric Co., The, Milwaukee, Wis.
National Welding & Mfg. Co., Buffalo, N. Y.

STEEL.
(Cold Rolled.)
Bourne-Fuller Co., Cleveland, O.
Pittsburg Shafting Co. of Detroit, Detroit.
Ward & Sons, Edgar T., Boston, Mass.

STEEL.
(Drawn.)
Pittsburg Shafting Co. of Detroit, Detroit.

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(Manganese.)
Taylor Iron & Steel Co., High Bridge, N. J.

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(Open-Hearth.)
Cambria Steel Co., Johnstown, Pa.
Portsmouth Steel Co., Portsmouth, O.

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(Structural.)
American Bridge Co. of New York, New York.
Bourne-Fuller Co., Cleveland, O.
Buffalo Steel Co., Tonawanda, N. Y.
Cambria Steel Co., Johnstown, Pa.
Carnegie Steel Co., Pittsburg, Pa.
Empire Iron & Steel Co., Niles, O.
Inland Steel Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburg, Pa.
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(Ammonia.)
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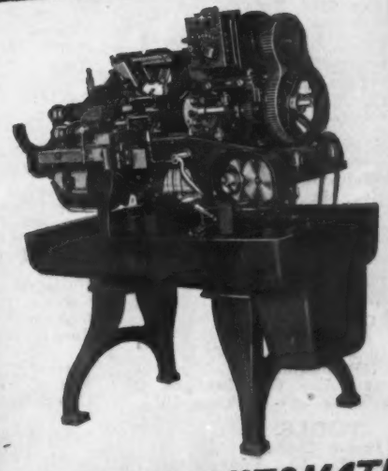

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TEETH.
(Steel Harrow.)
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Harbison-Walker Refractories Co., Pittsburg, Pa.

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Williams Tool Co., Erie, Pa.

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Scully Steel & Iron Co., Chicago, Ill.

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Republic Iron & Steel Co., Pittsburg, Pa.
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Bettcher Mfg. Co., The, Cleveland, O.
Graham Nut Co., Pittsburg, Pa.
Milton Mfg. Co., Milton, Pa.
National Bolt & Nut Co., Pittsburg, Pa.
Nicetown Plate Washer Co., Philadelphia, Pa.
Oliver Iron & Steel Co., Pittsburg, Pa.
Steel Car Forge Co., Pittsburg, Pa.
Upson Nut Co., Cleveland, O.
Wrought Washer Mfg. Co., Milwaukee, Wis.

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Dodge Mfg. Co., Mishawaka, Ind.

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(Electric Arc.)
Electric Controller & Mfg. Co., Cleveland, O.

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Long & Allstatter Co., Hamilton, O.

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(Autogenous.)
American Oxhydric Co., The, Milwaukee, Wis.
National Welding & Mfg. Co., Buffalo, N. Y.

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(Custom.)
National Welding & Mfg. Co., Buffalo, N. Y.

WELDING.
(Oxhydric.)
American Oxhydric Co., The, Milwaukee, Wis.

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(Alundum.)
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WHEELS.
(Grinding.)
Norton Co., Worcester, Mass.

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Bourne-Fuller Co., Cleveland, O.
Cambria Steel Co., Johnstown, Pa.
Jones & Laughlin Steel Co., Pittsburg, Pa.
Pittsburg Steel Co., Pittsburg, Pa.
Ward & Sons, Edgar T., Boston, Mass.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE.
(Cable and Rope.)
American Steel & Wire Co., Chicago, Ill.
Pittsburg Steel Co., Pittsburg, Pa.

WIRE.
(Grilles.)
American Steel & Wire Co., Chicago, Ill.
Bourne-Fuller Co., Cleveland, O.

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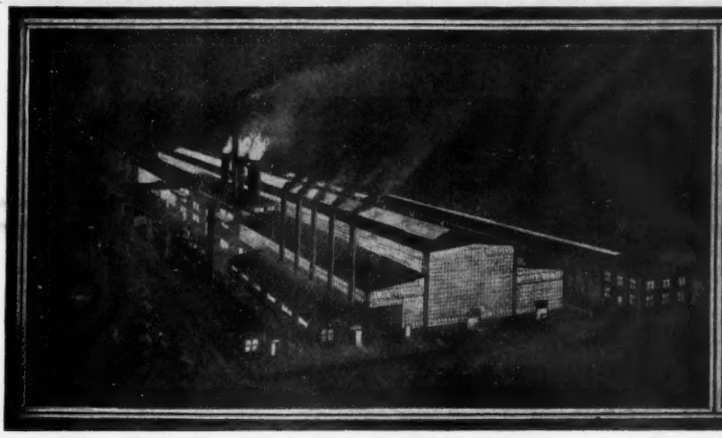
Coes Wrench Co., Worcester, Mass.
Dayton Malleable Iron Co., Dayton, O.
Ryerson, Joseph T., & Son, Chicago, Ill.



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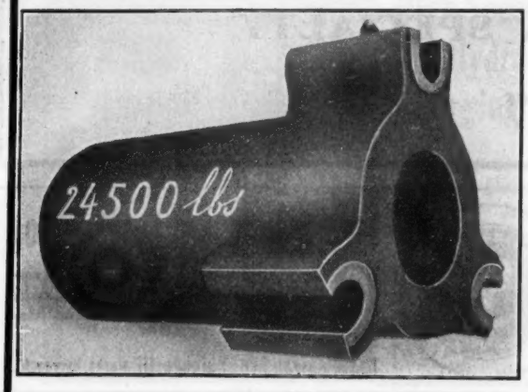

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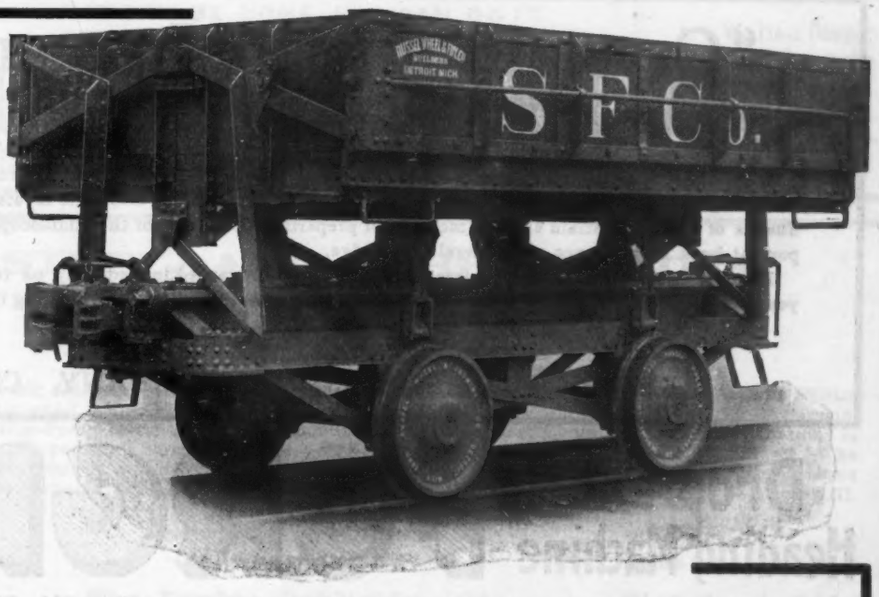

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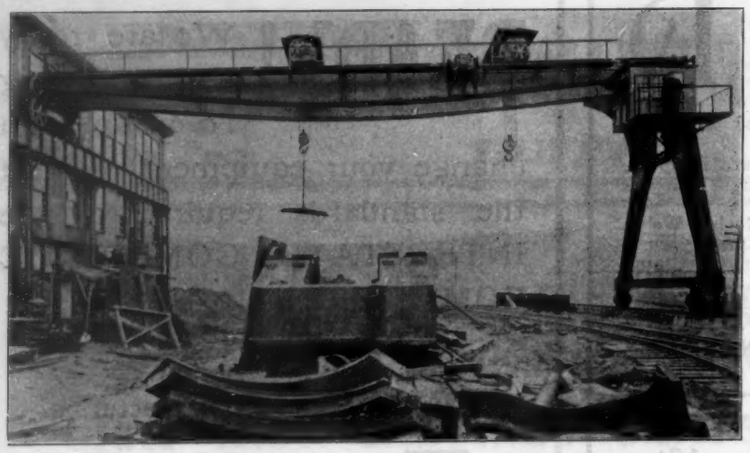

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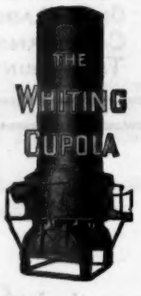

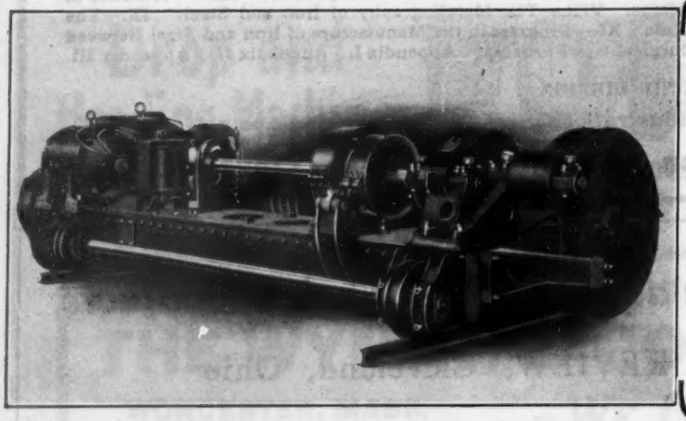

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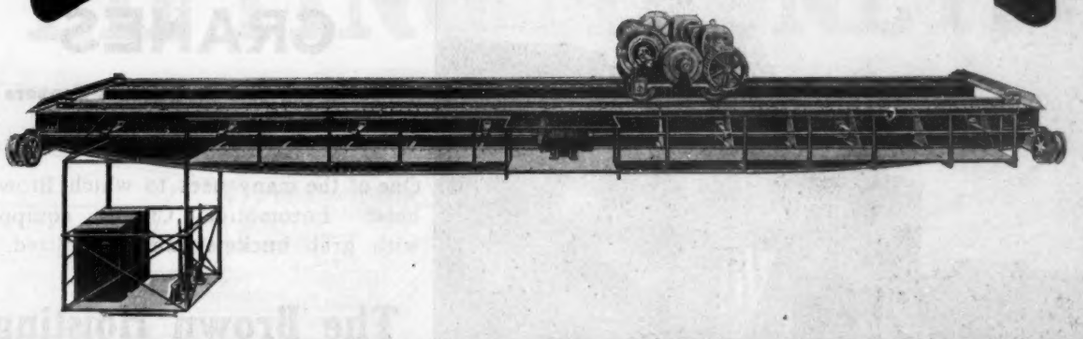

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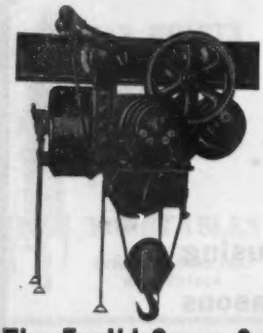

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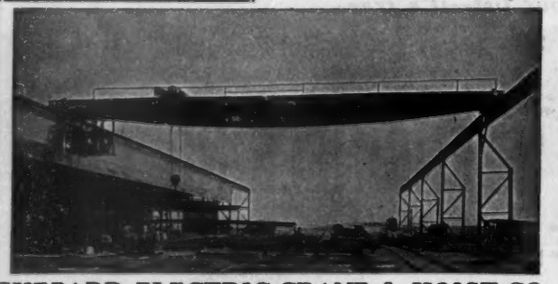

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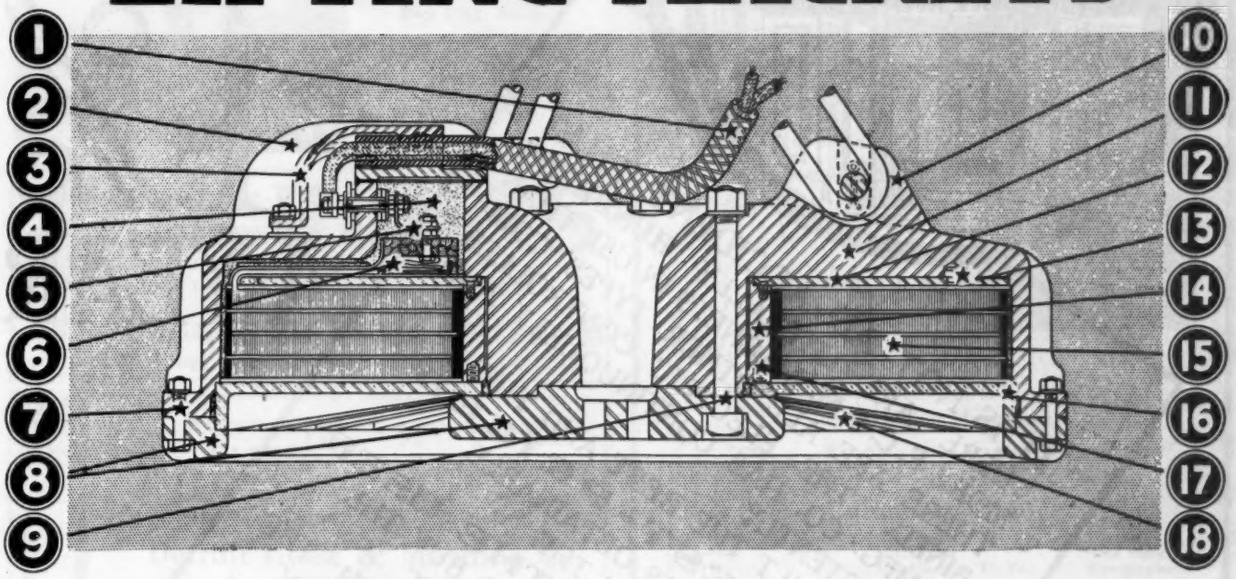

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12—Top plate of coil spool. Removably secured to core of spool making it possible to inspect or repair upper portion of coil without unwinding.

13—Dowel serving to prevent rotation of spool in magnet case.

14—Core of spool on which coil is wound. This and the top plate (12) are of steel of high permeability and form part of the inner pole. Note that all the advantages of spool construction are secured without adding to the weight of the magnet or increasing the length of the mean turn—two serious faults of magnets in which spool of non-magnetic material is used.

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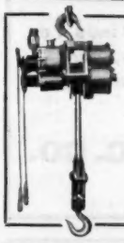

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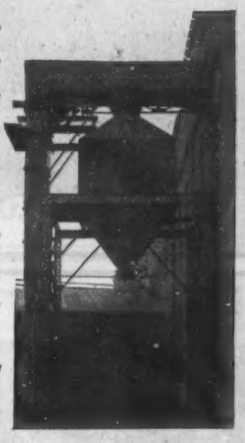

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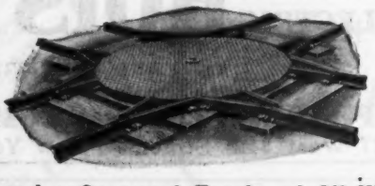

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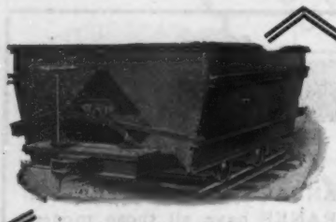

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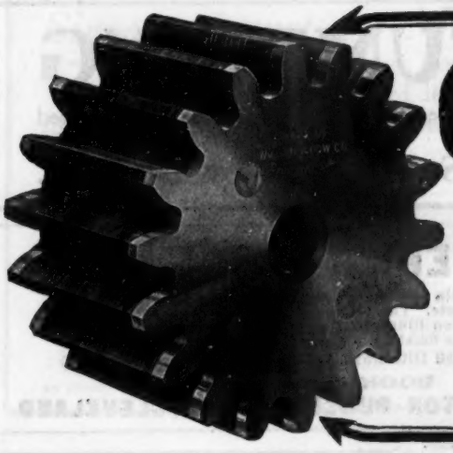

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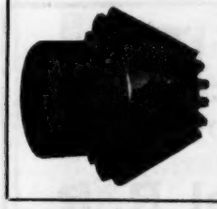

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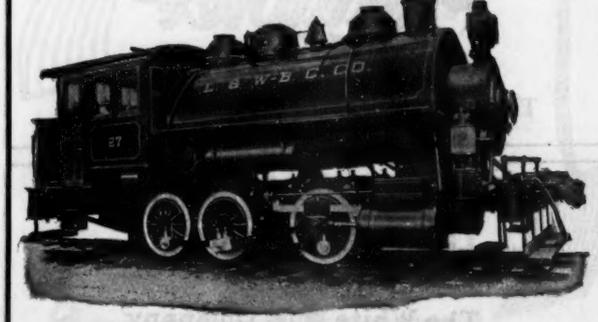

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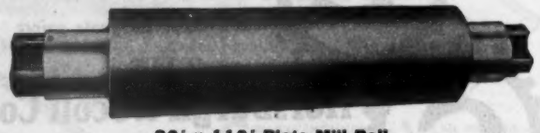

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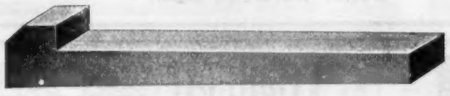

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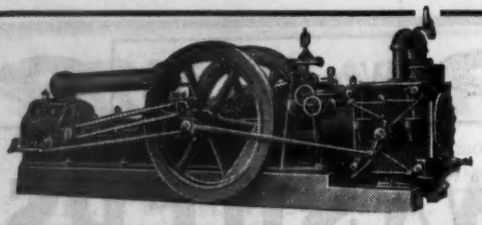

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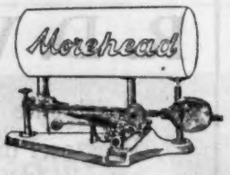

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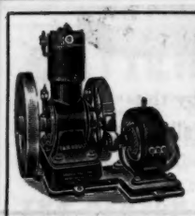

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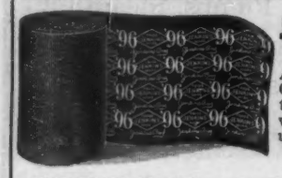

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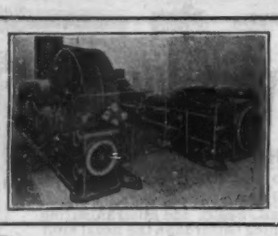

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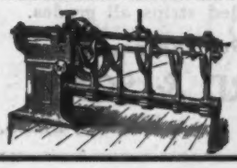

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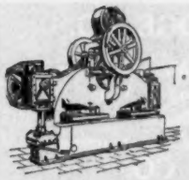

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By-Product Coke Ovens

We have been erecting plants completely for more than ten (10) years.

We have a skilled engineering organization. This enables us to prepare plans best suited to the individual requirements of each plant.

We have a competent construction force, permanently employed, with many years experience in this line of work.

We have extensive modern equipment of portable buildings, power plant, cranes, compressors and tools best adapted for doing the highest grade work economically and expeditiously.

We have our own shops and complete lines of patterns and build most of the machinery and equipment installed in our plants.

We have trained operating supervisors and established methods of operation by which the **best results** in by-product coke oven practice attained have been produced.

Therefore, we are in the best position to erect plants complete, to operate them and guarantee the best obtainable results.

See our latest plants. *Investigate our latest records.*

The United Coke & Gas Company,

17 BATTERY PLACE,
NEW YORK, N.Y.

Notwithstanding dull trade conditions in the iron and steel industries, the use of

Our Pocahontas Foundry and Furnace Cokes

is becoming more widespread each succeeding month as their *very superior qualities* become known to new trade, which we are constantly securing in all markets at home and abroad.

Our laboratory, at which *daily tests have been made during the past two years*, shows the average analysis of our product during this period is as follows:

Moisture	**.68**
Volatile	**1.25**
Ash	**7.56**
Carbon	**91.19**
Sulphur	**.618**
Phosphorus	**.0064**

REMEMBER these figures are the result of *analyses made daily* from samples selected only to represent coke as actually produced and not samples of our best coke only.

REMEMBER, TOO, when dealing with us *you are dealing direct* with the producer, *responsible to you* for quality and service, and not with irresponsible middlemen.

AGAIN REMEMBER our annual *capacity of two million tons* is large enough to insure you a full supply at regular intervals as you may require.

THE SUPERIORITY OF OUR COKE makes it possible for us to market it over the widest territory, so that *right now* it is being used from Ontario, Canada, to California, and from the Dakotas to Florida.

WE KNOW we must sell you *satisfactory coke*, on *satisfactory terms*, and give your requirements *satisfactory attention*, to create relations with you of a *satisfactory and lasting* nature. We want our relations with you to *commence and continue on a satisfactory basis*, and as we are not in business for a year, or for two years, but will be continuously for many years *we know* we must treat you well and fulfill our obligations to the letter, and *we are prepared to do this.*

Send us your orders and we will prove what we say.

POCAHONTAS COKE COMPANY

INCORPORATED

Main Office: BLUEFIELD, W. Va.

BRANCHES:

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1 Broadway	Fisher Bldg.	Traction Bldg.	153 Main St.	Board of Trade Bldg.

Lowest Fuel Consumption

THE great advantage of the **KOPPERS'** By-Product Process over the Bee Hive Oven is nowhere better shown than in this one item of **Fuel Consumption.**

In the **KOPPERS'** Oven, one ton of a coal mixture containing 22% of volatile matter will yield over 10,000 cu. ft. of gas. It takes less than 5,000 cu. ft. of this for fuel, leaving over 5,000 cu. ft. of surplus gas per ton of coal coked. By means of the admirable system of vertical Heating Flues and Cross Regenerators, the **KOPPERS'** Oven is kept constantly at a high even temperature, **thus requiring a minimum amount of fuel.**

In the Bee Hive Oven, the coal is placed into a cold oven (or relatively so), which consequently means that a large part of the coal in the charge must be used for fuel. As most of the gas escapes into the air, without being burnt, it has practically no value as fuel. **In the KOPPERS' Process the gas furnishes the entire fuel supply.**

A further disadvantage in Bee Hive Oven Coke is the great amount of Ash remaining because some of the coal is burned in the oven for fuel.

We can back up every statement made.

COME TO JOLIET AND BE SHOWN

H. KOPPERS

Contractor for By-Product Coke and Gas Ovens

JOLIET, ILLINOIS

Essen, Germany Vienna, Austria Paris, France Sheffield, England

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PYRO DUREX **FIRE BRICK** OKILO KOKOV

QUALITY—SERVICE—PRICE

You get all three of the above features when you buy PYRO.

PYRO is manufactured from the best materials in a thoroughly scientific way. From the selection of the clay, to the shipment, your order gets careful attention with regard to its particular service.

The next time you need firebrick *write PYRO.*

HAND-MADE
HIGH-GRADE
HEAT PROOF

The PYRO Clay Products Co.,

Don't stop investigating until you have tried PYRO.

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A book for makers and users of Alloys

CONTENTS—The Properties of Alloys as Related to those of Their Constituents, Phenomena of Solidification, What the Microscope Can Teach, Changes in the Structure of Alloys in the Solid Condition, Metals Used in the Preparation of Alloys, The Brasses, The Bronzes, Machinery Brasses and Bronzes, Bearing Bronzes and Other Copper Alloys, White Alloys, White Anti-friction Alloys, Light Alloys, Fusible Alloys, Nickel Alloys, Alloys of the recious Metals, Preparation of Alloys. ***Cloth bound, 290 pages, excellently illustrated. Price $2.50***

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Manufacturers of High Grade
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Blast Furnace Linings, Rolling Mill Heating Furnaces and Malleable Furnaces a Specialty.
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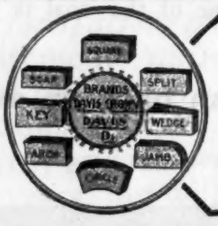

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FIRE BRICK For All Purposes

UNION MINING CO.
MT. SAVAGE, MD.
PROPRIETORS OF THE
MT. SAVAGE FIRE BRICK WORKS
(SUCCESSFULLY OPERATED FOR 70 YEARS)
MANUFACTURERS OF
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FIRE BRICK
For all purposes
Five Large Plants

ONE OF THE DOZEN QUARRIES IN AUSTRO-HUNGARY SUPPLYING OUR SPAETER MAGNESITE

Just a Word as to Spaeter Magnesite

Here's a typical mountain magnesite quarry at Veitsch, Austria, working a face three quarters of a mile long, over four hundred and fifty feet high.

It works simultaneously eight benches and with the most modern equipment, yet with a total *net* output of but 250 gross tons per day!

Why? Because it means mining over a thousand gross tons, hand sorting and culling to five hundred tons. That shows the care in selection.

This selected five hundred tons then goes to the kilns in the valley where calcining removes in gas, 50 per cent. of its weight.

The 250 tons of burnt magnesite is again hand picked at the sorting tables.

It costs something to do all this but the result is the Standard Spaeter Magnesite known to every Open Hearth man the world over.

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"Quality, Not Quantity."

We manufacture at our own Plants the highest quality of Magnesite, Chrome, Silica and Fire Clay Brick with personal attention of interested and expert managers. Our brands are the Highest Quality made and we would be pleased to prove this to you in actual work, as we have with others.

Six Modern Plants, - - - - 200,000 Daily Capacity

Located in Pennsylvania, Ohio, and Kentucky. The only company furnishing all grades of furnace material from their own plant.

THE HIGHEST GRADE REFRACTORIES OF ALL KINDS.

Blast Furnace Lining that stands the wear with Skip Hoists or Hand-Filled Furnaces.

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SOLE AGENTS—*Austro-American Magnesite Co. of Austria*

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Business Opportunities **Miscellaneous, etc.**
Advertisements under these heads cost 25c a line, Count seven words to the line.

CASH MUST ACCOMPANY ORDER

Help Wanted.

WE WANT 30 MOLDERS, 10 COREmakers, one coremaker foreman, all to be non-union men. None but good mechanics need apply. No strike. Good wages. Furnish references. Address Box 787, THE IRON TRADE REVIEW, Cleveland, O.

FIRST-CLASS OPEN SHOP GRAY IRON and steel molders wanted. Write, giving references, to United Metal Trades Association, 222 Commercial Club building, Portland, Ore.

THREE FIRST CLASS LOCOMOTIVE cylinder molders wanted. Piece work; highest prices paid. Steady employment. Open shop. Address Box 721, THE IRON TRADE REVIEW, Cleveland, O.

FOUNDRY FOREMAN, EXPERIENCED in grey iron, bench and floor work, also use of molding machines. State age, previous experience and salary expected. Give references. Open shop. Address Box 780, THE IRON TRADE REVIEW, Cleveland, O.

WANTED IN A WESTERN CITY A non-union molder foreman in established foundry making converter steel castings. Must be familiar with molding machine practice and capable of handling men. State experience and wages required. Address Box 886, THE IRON TRADE REVIEW, Cleveland, O.

WANTED FOREMAN FOR GRAY IRON jobbing foundry (medium and heavy castings). Not over 40 years of age. Must have ability to handle men and get results. State age and experience. Address Warden King, Ltd., Maisonneuve, Montreal, Que., Can.

WANTED:—A MAN TO TAKE CHARGE of chipping and cleaning department, and also act as shipping clerk in a gray iron foundry making a general line of machinery castings. Address Box 902, THE IRON TRADE REVIEW, Cleveland, O.

WANTED — AN EXPERIENCED MAN familiar with estimating on foundry and machine work, in a shop doing a general jobbing business, in the vicinity of New York City. Address, stating experience and salary expected, Box 893, THE IRON TRADE REVIEW, Cleveland, O.

WANTED EXPERIENCED MACHINIST, capable of doing pattern work—also assistant. Fetzer & Co., Springfield, Ill.

WANTED: — DRAUGHTSMEN FOR crane work. One experienced on structural design. State reference, experience and wages desired. Address The Toledo Bridge & Crane Co., Toledo, O. I. T. R.

WANTED: — ELECTRICAL MEN, EXperienced on controller and crane work. Steady employment. Give reference, state experience and wages desired. Address The Toledo Bridge & Crane Co., Toledo, O. I. T. R.

WANTED: — EXPERIENCED CRANE erectors. Steady employment. Give reference. State experience and name wages desired. Address The Toledo Bridge & Crane Co., Toledo, O. I. T. R.

WORKING FOREMAN: — GRAY IRON Foundry making medium weight machine and architectural castings. State age, previous experience and salary expected. Give references. Address Box 924, THE IRON TRADE REVIEW, Cleveland, O.

Help Wanted

WANTED—TWO FIRST CLASS SHEET and roonng salesmen for large trade. Men with an established clientele preferred. Address Stark Rolling Mill Co., Canton, Ohio.

WANTED:—A COMPETENT MACHINE salesman by an incorporated company doing $50,000 to $75,000 worth of business a year in iron and wood working machinery, engines and boilers. Party must have $2,500.00 to invest. A good salary and steady position for the right party. Address Box 948, THE IRON TRADE REVIEW, Cleveland, O.

WANTED:—CHEMIST; ONE WHO HAS had experience in car wheel foundry preferred. State references, age, experience, salary expected. Address Box 942, THE IRON TRADE REVIEW, Cleveland, O.

AN EXPERIENCED MALLEABLE AND gray iron shipping clerk. Please state experience and salary expected and how soon you could be on the job, also give reference. Address Box 955, THE IRON TRADE REVIEW, Cleveland, O.

SALES MANAGER. POWER TRANSmission department, pulleys, shafting, hangers, belting, etc. Must have experience in line. Address P. O. Box 62, Cleveland, O.

Positions Wanted

POSITION AS PATTERN FOREMAN BY high grade reliable man, capable of first class results on wood and metal patterns. Address "L. L.," THE IRON TRADE REVIEW, Cleveland, O.

FIRST CLASS FOUNDRY SUPERINtendent desires position with a reliable concern; understands the operation of molding machines and is thoroughly familiar with pump work and the jobbing trade. Address Box 827, THE IRON TRADE REVIEW, Cleveland, O.

MANAGER OR SUPERINTENDENT—Energetic, aggressive, experienced in manufacture of plumbers' brass work, valves, etc. Can handle help, and get the work out of foundries and shops; modern methods; interchangeable parts; technical education. Address Box 786, THE IRON TRADE REVIEW, Cleveland, O.

AS FOREMAN OF OPEN-HEARTH Steel Foundry. 25 years experience. Strictly sober. Best references. Address Box 830, THE IRON TRADE REVIEW, Cleveland, O.

EXPERIENCED FOREMAN ON MAchinery and engine work, desires position. Good manager and cost reducer. Mix iron by analysis. Married, sober, reliable. References. Address Box 823, THE IRON TRADE REVIEW, Cleveland, O.

PRACTICAL FOUNDRY SUPERINTENDent or General Foreman desires to get in touch with reliable firms only, who are in need of first class man. Address Box 857, THE IRON TRADE REVIEW, Cleveland, O.

SUPERINTENDENT OR FOREMAN OF brass foundry, up-to-date, wishes to change. Address "Up-to-date," THE IRON TRADE REVIEW, Cleveland, O.

POSITION WANTED AS SUPERINTENDent, in Malleable Iron Foundry. Take entire charge of plant from raw material to shipping of castings. Thoroughly practical in modern malleable methods and shop system. Up-to-date, expert mixer and annealer. A-1 references. Address Box 847, THE IRON TRADE REVIEW, Cleveland, O.

Positions Wanted

PRACTICAL FOUNDRY ACCOUNTANT and cost expert, with years of shop experience, is prepared to make investigations, etc., relative to efficient and economical handling of Iron, Steel and Brass Foundries, also will install economical and workable foundry cost and production system. Best of references. Address "Economy," THE IRON TRADE REVIEW, Cleveland, O.

WANTED — POSITION AS FOREMAN Coremaker in large Grey Iron Jobbing Foundry. Can handle any kind of work and men. Address Box 851, THE IRON TRADE REVIEW, Cleveland, O.

FIRST-CLASS FOUNDRYMAN WANTS position with a good company. Good mixer and handler of men. I have 17 years' experience as foreman on hot water boiler, and light machinery castings. References furnished from last employers. Can come on short notice. Address Box 853, THE IRON TRADE REVIEW, Cleveland, O.

SITUATION WANTED BY AN EXPERIenced Gray Iron Foundry foreman age 26, married. Well up on machine molding, cupola practice and thoroughly competent to mix all irons by chemical analysis. Can furnish best of references as to character and ability. Address Box 861, THE IRON TRADE REVIEW, Cleveland, O.

POSITION WANTED AS FOREMAN IN heaters, where they make Steam and Hot Water Boilers. 10 years in my present position, have 20 years in the Heating shop, also in Stove plate, understand Cupola and the mixing of iron. Open for engagement on the first of new year. Address Box 859, THE IRON TRADE REVIEW, Cleveland, O.

WANTED POSITION AS SUPERINTENdent in up-to-date Malleable iron foundry. Am employed, but want to make a change. Address Box 862, THE IRON TRADE REVIEW, Cleveland, O.

POSITION WANTED AS SUPERINTENdent or general foreman, by a thorough foundryman having had long experience on stove plate, gas ranges, heaters, and light work of all kinds. Expert on molding machines and match plate equipment. Perfect in cupola practice. At present employed in one of the largest and best equipped foundries in the country. Solicits correspondence from large concerns contemplating a change in the management of their foundries. Open shop preferred. High grade reference furnished. Address "Molding Machine Expert," THE IRON TRADE REVIEW, Cleveland, O.

FOREMANSHIP OF ALUMINUM FOUNdry, eight years practical experience, understand machine molding and oil furnaces. Can handle men to get the results. Can furnish reference. Address "Aluminum," THE IRON TRADE REVIEW, Cleveland, O.

POSITION WANTED AS SUPERINTENDent or General Foreman by a thoroughly up-to-date practical man. Am familiar with all departments connected with foundry using modern methods. Am a married man, 40 years of age, sober and able to furnish best of references as to character and ability in handling men and producing results. Address Box 870, THE IRON TRADE REVIEW, Cleveland, O.

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Business Opportunities **Miscellaneous, etc.**
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Positions Wanted

AS SUPERINTENDENT OF FOUNDRY and Machine Shop by a thoroughly practical man having 22 years experience, who is sober and reliable. An expert on machine molding and understands the mixing of iron by analysis. 39 years of age, and can handle men to advantage, both in lowering cost and increasing production. Open shop preferred. Can furnish A-1 references. Any good concern in need of a man with above abilities, would do well to address Box 879, THE IRON TRADE REVIEW, Cleveland, O. a

WANTED:—POSITION AS FOUNDRY superintendent by thorough draughtsman, patternmaker and foundryman of twenty years experience. Thoroughly familiar with molding machine work. Address "G. F." THE IRON TRADE REVIEW, Cleveland, O.

FOUNDRY FOREMAN WISHES POSItion with reliable firm looking for a young and energetic foundryman who is up-to-date in all departments. Address Box 885, THE IRON TRADE REVIEW, Cleveland, O.

STRICTLY FIRST CLASS FOUNDRYman is open for a position as Superintendent or Foreman. Address Box 891, THE IRON TRADE REVIEW, Cleveland, O.

PRACTICAL FOUNDRY SUPERINTENdent of 20 years experience desires a position with up-to-date concern. Bench or Heavy work. Address Box 892, THE IRON TRADE REVIEW, Cleveland, O.

PRACTICAL FOUNDRY FOREMAN IN malleable iron and all its branches. Having full charge of shop for 17 years. Can handle men to advantage. Can furnish references. Address Box 866, THE IRON TRADE REVIEW, Cleveland, O.

FIRST CLASS FOUNDRY FOREMAN, 42 years old, 28 years experience, 8 years foreman, specialist in high grade Ornamental Iron and Bronze, Art work included. Manage work at lowest cost. Knowledge in every line of foundry work and mixture of all kinds of metals. Address Box 889, THE IRON TRADE REVIEW, Cleveland, O.

FOUNDRY FOREMANSHIP WANTED by competent man, at present head foreman of a large Foundry doing high grade heavy and light castings. Would like to change New Year. Middle west preferred. Address Box 938, THE IRON TRADE REVIEW, Cleveland, O.

POSITION AS FOUNDRY FOREMAN wanted by a young, sober and reliable man, has wide experience in steel foundry, green and dry sand molding, bench and floor work. Western Canada preferred. Address Box 896, THE IRON TRADE REVIEW, Cleveland, O.

FOUNDRY FOREMAN—A-1 MAN, up-to-date in all grades of gray iron, machine and automobile castings, accustomed to molding machines. Will be open for position about Dec. 5th. Address Box 899, THE IRON TRADE REVIEW, Cleveland, O.

BRASS FOUNDRY SUPERINTENDENT or foreman, experienced on automobile castings in aluminum and brass, valve and general jobbing lines. Well versed in molding machines and a good executive. Address Box 898, THE IRON TRADE REVIEW, Cleveland, O.

Positions Wanted

STEEL FOUNDRY FOREMAN WISHES position in foundry equipped with side blower converters, can operate, first-class man, medium and light work, dry and green sand-casting. Can handle men to best advantage. Address Box 900, THE IRON TRADE REVIEW, Cleveland, O.

FIRST CLASS BRASS FOUNDRY FOREman open for position of good executive ability. Twenty years' experience, nine as Foreman, expert metal mixer and cost reducer. First class references furnished. Address Box 873, THE IRON TRADE REVIEW, Cleveland, O.

FOUNDRY CHEMIST OPEN FOR ENgagement. Experienced on mixtures for all kinds of gray iron castings. Practical cupola man. A-1 references. Address Box 878, THE IRON TRADE REVIEW, Cleveland, O. a

POSITION WANTED BY FIRST CLASS Foundry Foreman. Accustomed to all kinds of machinery, heavy mining machinery a specialty. Will take a hand on the floor if necessary. Address Box 869, THE IRON TRADE REVIEW, Cleveland, O.

AS SUPERINTENDENT OR FOREMAN, 24 years' experience, thoroughly understands the mixing of metals and up-to-date methods of iron, steel, brass and babbitts. Exceptionally good reference. 39 years of age. Rolling mill foundry preferred. Address Box 904, THE IRON TRADE REVIEW, Cleveland, O.

ROLLER ON GUIDE; OR COMBINAtion bar and guide mill, by competent man of good character and steady habits, work guaranteed. Address Geo. I. Sturgis, Woodbury, Conn.

PRACTICAL FOUNDRY SUPERINTENdent open for immediate engagement with an up-to-date concern. Thoroughly familiar with water and steam heaters, and foundry management in general. Address Box 901, THE IRON TRADE REVIEW, Cleveland, O.

WANTED A POSITION AS ASSISTANT superintendent in a malleable foundry, by an up-to-date man, thoroughly experienced. A-1 reference. Address Box 903, THE IRON TRADE REVIEW, Cleveland, O.

MANAGER OR SUPERINTENDENT IS open for engagement. Twenty years' experience in malleable, gray iron and crucible steel. Good executive and organizer. Practical and up-to-date on mixtures, molding machines, costs, sales and general economical operation and management. First class references. Address Box 706 THE IRON TRADE REVIEW, Cleveland, O.

POSITION WANTED AS FOUNDRY foreman by young man, 30 years of age, with 15 years' experience in producing first-class malleable iron castings, also handle molding machines and help to advantage. Good references given if necessary. At present employed. Address Box 907, THE IRON TRADE REVIEW, Cleveland, O.

POSITION WANTED BY AN EXPERIenced foundryman and chemist. I possess my own laboratory. A-1 man on all molding machines. Wishes a position where quality and economic production is looked for. Address Box 852, THE IRON TRADE REVIEW, Cleveland, O.

TO REPRESENT ON COMMISSION basis manufacturers of mine, furnace and mill machinery and equipment; Birmingham district, Alabama as territory. Address "B." THE IRON TRADE REVIEW, Cleveland, O.

Positions Wanted

SITUATION WANTED AS SUPERINtendent or Chemist in a Blast Furnace. Had eleven years experience as Chemist and Superintendent at Charcoal Furnace. Address Box 925, THE IRON TRADE REVIEW, Cleveland, O.

Business Opportunities.

FOUNDRY FOR RENT. IMMEDIATE possession, suitable for job or heavy gray iron work. Good brick building with several frame additions, two cupolas, two large swing cranes, core oven, charging elevator, large and small ladles, scales, blowers, motors, office, etc. Desirable location, favorable labor conditions, and C. B. & Q. switch. Chicago outer belt (E. J. & E.), C. & N. W. and C. M. & G. railroads also available. Address Akron Co., Aurora, Ill.

FOR SALE: — TO SETTLE ESTATE, foundry and machine works in full operation, successful for 45 years. Good town, near Washington, D. C. Two lines of railroad. A bargain for man of limited capital. Reasonable terms to quick buyer. Write for details if you can raise $4,000. Address Box 863, THE IRON TRADE REVIEW, Cleveland, O.

WANTED PRACTICAL MACHINES FOR making odd shaped cores. We will buy outright or pay royalty for right device. Address Box 897, THE IRON TRADE REVIEW, Cleveland, O.

WE HAVE SMALL, WELL EQUIPPED machine shop and want few good articles to manufacture. Might also assist in marketing if desired. Address P. O. Box 636, Erie, Pa.

AN ACTIVE PARTNER IN A SMALL gray iron foundry in northern Oklahoma, or sell out. Small capital needed. If you are interested and an active man, write "E. M. H.," THE IRON TRADE REVIEW, Cleveland, O.

FOR SALE—A MODERN, UP-TO-DATE jobbing foundry and machine shop in the best town in Oregon. This is a first-class opportunity for a man with small capital. Address Box 908, THE IRON TRADE REVIEW, Cleveland, O.

La SOCIETE ANONYME des ETABLISsements Ph. Bonvillain & E. Ronceray, 9 and 11 Rue des Envierges, Paris (France), announce that they have bought back the Patent right for the Universal System of Machine Moulding, also their System of Pattern Plate Making. They are ready to consider offers from a reliable American firm to handle this line of equipment, which has been greatly improved during the past 12 months. The Universal System has been applied at a considerable extent abroad for making moulds for all kinds of castings from those weighing a few ounces to several tons.

WANTED AN HONEST YOUNG MAN to invest $2,000 or more in an up-to-date foundry, pattern and machine shop. Well established in a good mining district and doing good business. A splendid opportunity for the right man. One who is capable to take charge of an office. Address Box 817, THE IRON TRADE REVIEW, Cleveland, O.

WANTED—ONE OR TWO ACTIVE MEN to join the advertiser in the best specialty Foundry and machine proposition in the east, about $10,000.00 required. Address "W. E. P." care THE IRON TRADE REVIEW, 90 West St., New York City.

(See next page.)

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Miscellaneous

ELECTRIC MOTORS RENTED, 1 H. P. and larger. Largest stock in America. Dynamos and motors bought, sold, exchanged and repaired. Gregory Electric Co., Gregory, Bldg., 16th and Lincoln Sts., Chicago, Ill.

AMERICAN WATCHMAN'S TIME DEtector Clock for 100 keys. Never used. 33 per cent off. Address Box 894, THE IRON TRADE REVIEW, Cleveland, O.

NO. 32 HAWLEY DOWN DRAFT OIL furnace for sale, condition guaranteed. Address Box 743, THE IRON TRADE REVIEW, Cleveland, O.

SECOND-HAND FOUNDRY EQUIPMENT wanted, including Cupolas, Ladles, Tumbling Barrels, etc. Quote price and state condition. Address Box 746, THE IRON TRADE REVIEW, Cleveland, O.

FOR SALE:—SIX FARWELL BENCH squeezer machines at low price. The Sessions Foundry Co., Bristol, Conn.

A SPECIALTY WANTED TO MANUfacture in a modern Boiler and Iron Works. Address "A. C." THE IRON TRADE REVIEW, Cleveland, O.

Miscellaneous

FOR SALE—EXHAUST TUMBLING Mills, made by Sly Mfg. Co., Cleveland. One 20 x 34, one 24 x 40, one 26 x 40, one No. 108 Unit Dust arrester with No. 18 Fan and Counter Shaft. Used only few months. Will sell at low price. WESTERN MALLEABLE & GREY IRON MFG. CO., Port Washington, Wisconsin.

FLUOR SPAR—EVERY GRADE, QUOTAtions delivered anywhere. Cheapest suppliers. Address GEO. G. BLACKWELL SONS & CO., Ltd., Liverpool, Eng., or Agents, Penna. Salt Mfg. Co., Pittsburg, Pa.

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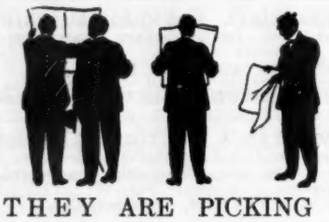

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(2) Eynon Plain Millers.

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(1) 15-in. Smith & Mills Single Geared Crank
(1) 16-in. Steptoe Crank
(1) 16-in. Gould & Eberhardt Crank
(1) 20-in. Kelly Crank
(1) 24-in. Gould & Eberhardt
(1) 24-in. Ohio Shifting Belt
(1) 26-in. Cincinnati Shifting Belt
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40 x 72 in. Allis Heavy Duty Corliss.
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30 x 60 in. Lane & Bodley
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One 14 x 16 straight line engine, belted type, in strictly first-class condition.

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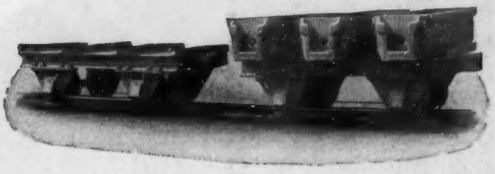

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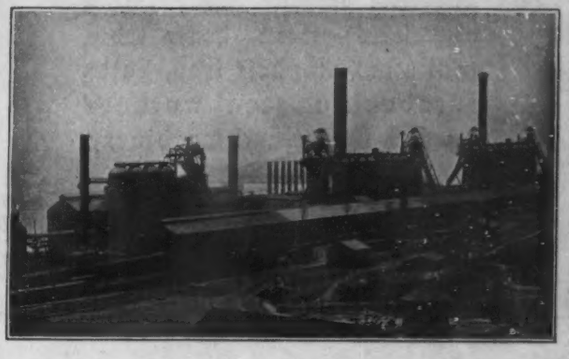

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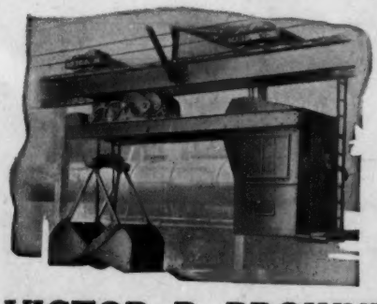

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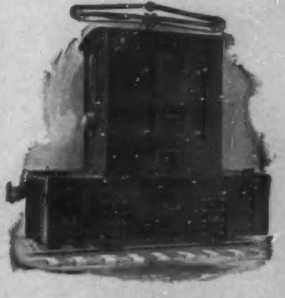

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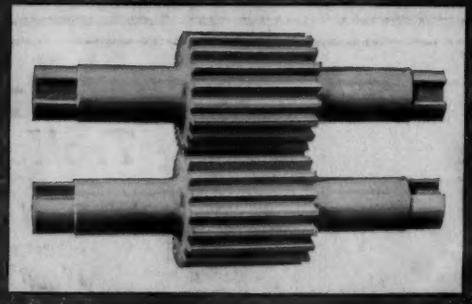

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